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Red Hill Creek Expressway North-South Section

DRAFT

Draft
Summary
Report
Vol. 1
November 1997



Ministry
of
Transportation

"I didn't know that".

It is interesting to observe how often this statement is heard when diverse interests come together in a consultative process. Our perceptions of any given situation are significantly influenced by the information available to us. Differences may arise simply because another interest filters the world through a different knowledge base.

This draft document is intended to provide participants a shared understanding of background information relevant to the Impact Assessment and Design Process for the North-South Expressway. It represents a distillation of key data drawn from decades and volumes of research and analysis. This Draft will be refined in response to comments and concerns raised and discussed by participants.

The final version of this document will provide the common information base for future deliberations concerning impact prediction and the development of mitigation/compensation measures. Therefore, it is very important for you to read this document and ensure that you are comfortable working with the information as it is presented.

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Introduction

1.1

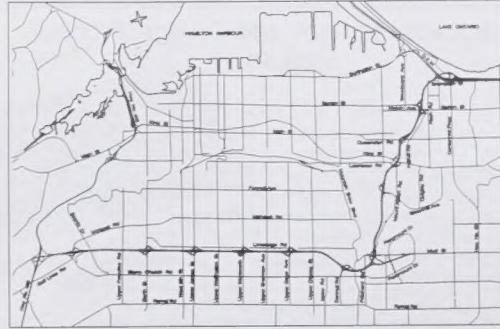
Background

In December 1982, the Region of Hamilton-Wentworth submitted an Environmental Assessment (EA) under the Environmental Assessment Act which documented the need, scope and timing for the expansion of the Regional roadway network. Conclusions reached in the EA address the construction of a roadway that connects Highway 403 in Ancaster to the Queen Elizabeth Way (QEW) in the eastern portion of the City of Hamilton (see map). Project approval was subsequently granted by a Joint Hearing Board (i.e., Ontario Municipal Board and Environmental Assessment Board) in 1985, and later endorsed by Cabinet in 1987.

The roadway comprises two sections: the East-West "Mountain" section which has since been renamed the Lincoln M. Alexander Parkway (the "Linc"), and the North-South "Valley" section. Construction of the "Linc" proceeded in 1990 and was completed from Highway 403 to Dartnall Road in October, 1997. Construction of the Valley section, which is the focus of this Draft Summary Report, started in 1990 but due to the withdrawal of Provincial funding later that year, only partial work in the vicinity of King Street and Queenston Road was completed. Since that time the Region has considered a number of design changes which are expected to reduce impacts to environmental features/systems existing in and adjacent to the Red Hill Creek Valley.

In May 1996, the Region submitted an

Exemption Order request to the Ministry of Environment and Energy to allow prescribed changes to be made to the original North-South section design. This document proposed an assessment process by which remaining government approvals and final design changes to the original North-South alignment will be undertaken. In March 1997, the Minister of Environment and Energy approved the Region's Exemption Order request. The Region is now legally required to fulfill the commitments presented in that document.



1.2

Present Work

In May 1997, the Region launched the first of two major planning exercises described in the Provincial Exemption Order. The Red Hill Creek Watershed Plan (the Plan) is a multi-stakeholder process intended to provide a framework and guidance for managing change in the watershed. Specifically, it is meant to influence planning, management and stewardship decision-making at all levels, from senior governments to individual residents of the Watershed, in the hopes of fostering long term environmental, social and economic sustainability.

At the present time the Plan has advanced to the stage where specific issues and options related to recreational activities, water, wildlife, and cultural landscapes

are developed so that projects like the Expressway can receive this guidance before design refinement and impact mitigation decisions are made. The first generation Watershed Plan is expected to be published at the end of February 1998.

The second major planning exercise involves the assessment and mitigation of Expressway impacts. In June 1997, the Region in partnership with the Ontario Ministry of Transportation (MTO), presented to the public a schedule which identified how the Region and MTO would satisfy remaining government approvals and arrive at a final design for the North-South alignment, including changes to the QEW (the area under MTO jurisdiction). The four phase process, hereinafter referred to as the Impact Assessment and Design Process (IADP), is expected to be completed at the end of April 1998. The sequence and schedule of IADP steps is documented on the next page.

1.1

Background

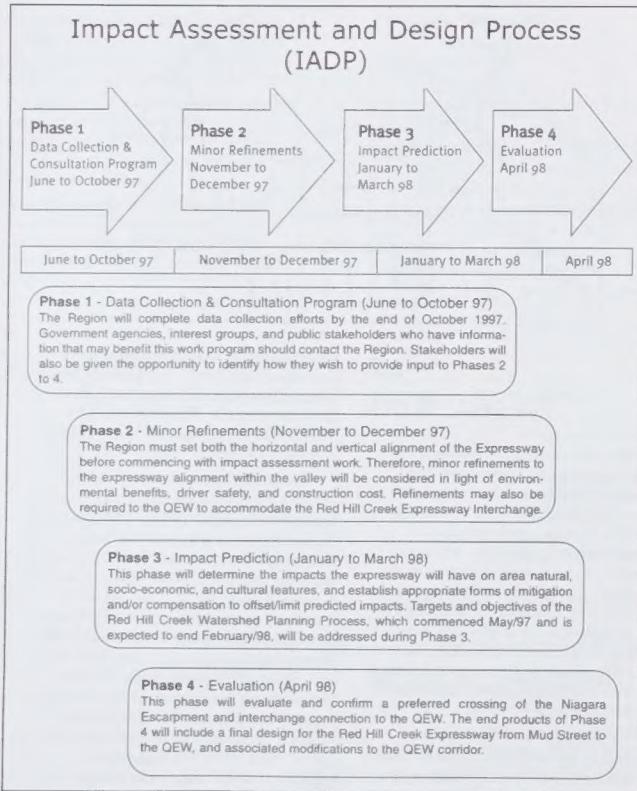
1.2

Present Work

CHAPTER 1

1.3 Future Work

1.4 This Draft Summary Report (Volume 1)



1.3 Future Work

Immediately following April 1998, the Region/MTO will prepare and submit documents to government agencies that will enable them to secure approvals and proceed with contract preparation. The Expressway construction program is expected to begin the Fall of 1998 and end in 2002.

1.4 This Draft Summary Report (Volume 1)

This report is the first of a two volume summary that will ultimately guide government and public discussions concerning minor expressway refinements, impact prediction/mitigation, and evaluation. Volume 1 presents information on the existing natural environment and human settlement features that will likely be impacted by the Expressway.

As set out in the Exemption Order, changes to the approved expressway design will be made to avoid/minimize impacts to important features if they prove to be technically feasible and beneficial to the environment. Information contained in this report will provide the reader a summary understanding of:

- what is known about the natural environment and human settlement features

that currently exist in the Red Hill Creek Watershed and, in more detail, within the immediate area of the Expressway (Chapter 2);

- the approved Expressway design (Chapter 3);
- guidance from the Watershed Plan and other comments regarding the types of design refinements the Region should consider before carrying out detailed impact assessment work (Chapter 4); and,
- future activities.

Reviewers of this draft report are encouraged to ask questions, propose changes and provide general overall comments.

Volume 2 will document predicted expressway impacts, mitigation/compensation measures, evaluation and consultation activities. This work will be prepared after a decision has been reached on design changes that warrant more detailed investigation.

Existing/Future Conditions: Natural Environment & Human Settlement

2.1

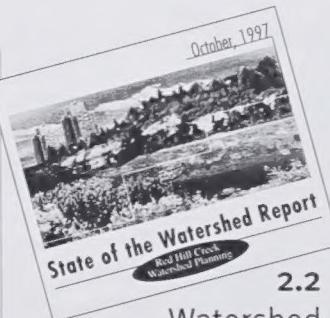
Red Hill Creek Watershed / Expressway Relationship

A watershed is an area drained by a river or a creek system. The Red Hill Creek watershed drains an area approximately 5000 hectares in size (see Watershed Map). All living features and functions that exist within this area are sustained or affected in some direct or indirect way by the water that falls, collects, and eventually drains to Hamilton Harbour. Water is a life sustaining force for all living things and the environment in which they exist.



There are interconnections and relationships between human activities on land, their impact on water and the subsequent effects on organisms that use this water. The boundaries of a watershed provide the natural limits for examining these interconnections and the resulting state of the environment and the resources within.

For the Expressway project, we will consider both the site specific and broader watershed (ecosystem) impacts the road will create during and after construction. The particular effect (positive or negative) and magnitude (small or large) of the impact will consider the interconnection and relationship the site specific feature has to other features found in the watershed. This systems approach to impact prediction will also help in the development of appropriate mitigation/compensation measures.



2.2

Watershed Conditions

A report entitled "State of the Watershed Report - Red Hill Creek Watershed Planning", October, 1997 has been published and is now available for public review. It documents in summary fashion what is known about the following watershed features:

- soils and geology,
- groundwater,
- surface water,
- streams,
- fisheries,
- terrestrial resources,
- water quality,
- contaminants,
- air quality,
- land use,
- trails, open space and recreation, and
- cultural heritage.

A series of detailed reports are also available for those who require more specific technical information on each feature previously mentioned. These reports have been placed in the following locations:

- Central Library, Municipal Reference Section, City of Hamilton
- City of Stoney Creek Library
- Sherwood Library, Upper Ottawa Street, Hamilton
- Canadian Centre for Inland Waters Library
- Planning Department, 7th Floor, Hamilton City Hall
- Engineering Department, Stoney Creek City Hall
- Clerks Office, Township of Glanbrook
- Special Projects Office, Regional Municipality of Hamilton, 25 Main Street West

If you are interested in viewing these reports, ask for the Red Hill Creek Watershed Technical Background Reports.

Those interested in Expressway design and impact assessment issues are encouraged to review this material. Chapter 4 of this report, will highlight the major issues that have emerged from this work and the options that could be implemented to resolve those issues.

2.1

Red Hill Creek Watershed / Expressway Relationship

2.2

Watershed Conditions

2.3**Expressway Study Area Conditions****2.3**
Expressway Study Area Conditions

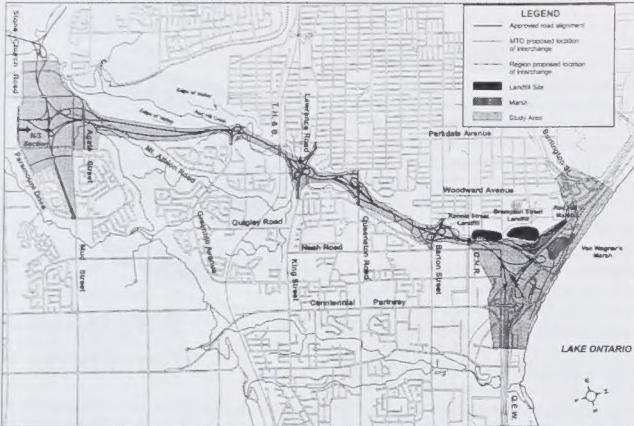
The following describes the natural environment and human settlement conditions that exist within and immediately adjacent to the pathway of the Expressway (see Expressway Study Area Map). Included are:

Natural Environment

- Terrestrial Resources
- Groundwater
- Surface Water
- Water Quality
- Streams
- Fisheries

Human Settlement

- Land Use and Infrastructure
- Known and Potential Contaminant Sources
- Cultural Heritage
- Noise
- Air Quality
- Visual Resources (Niagara Escarpment)
- Private/Public Property



Each condition is first illustrated and then described in the following manner:

1. Focus

Type of information used to describe the condition.

2. What is known

Findings based on available information and additional field research.

3. Key legislation and policy

Requirements the Region/MTO will have to meet when carrying out Expressway impact assessment and design work.

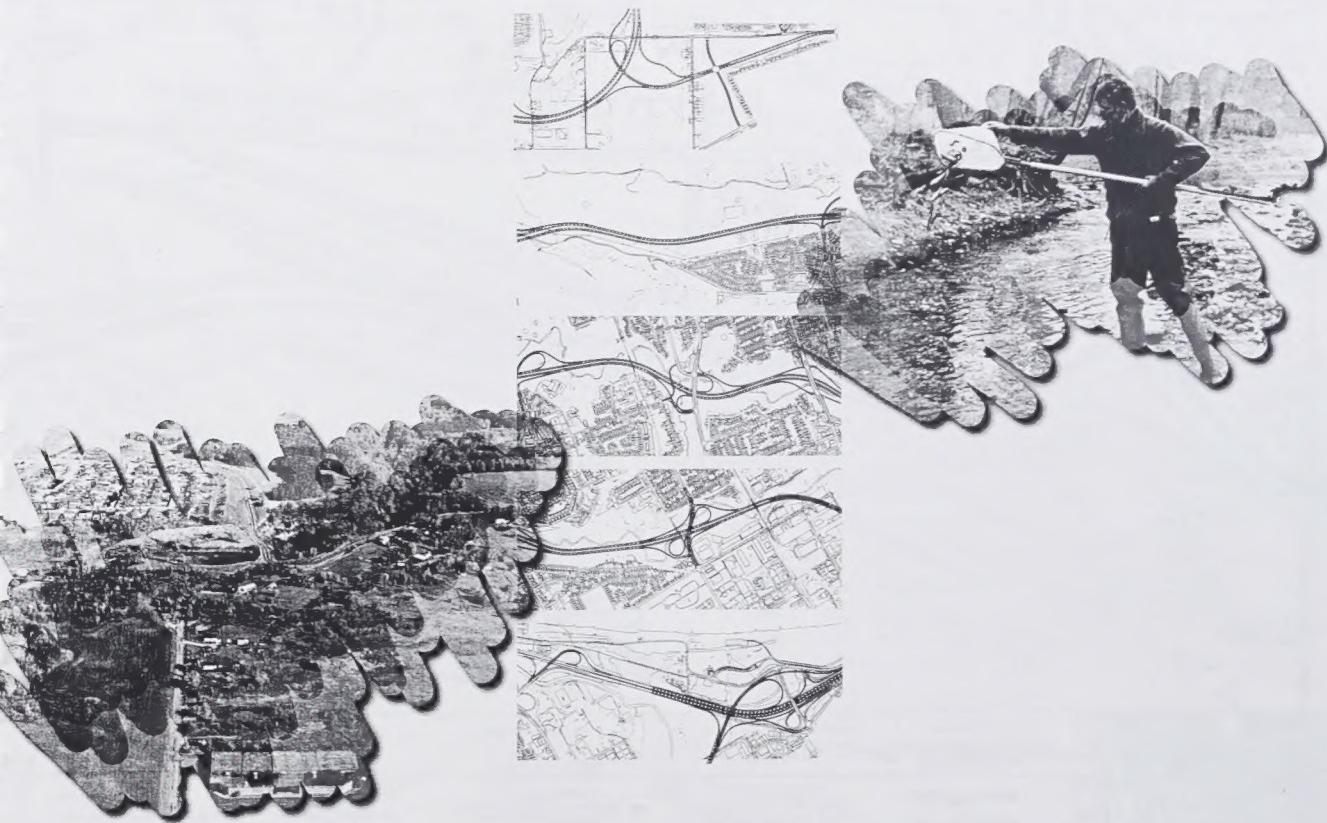
4. Key sources of information

List of background documents that have contributed to our current knowledge.

Natural Environment

CHAPTER 1

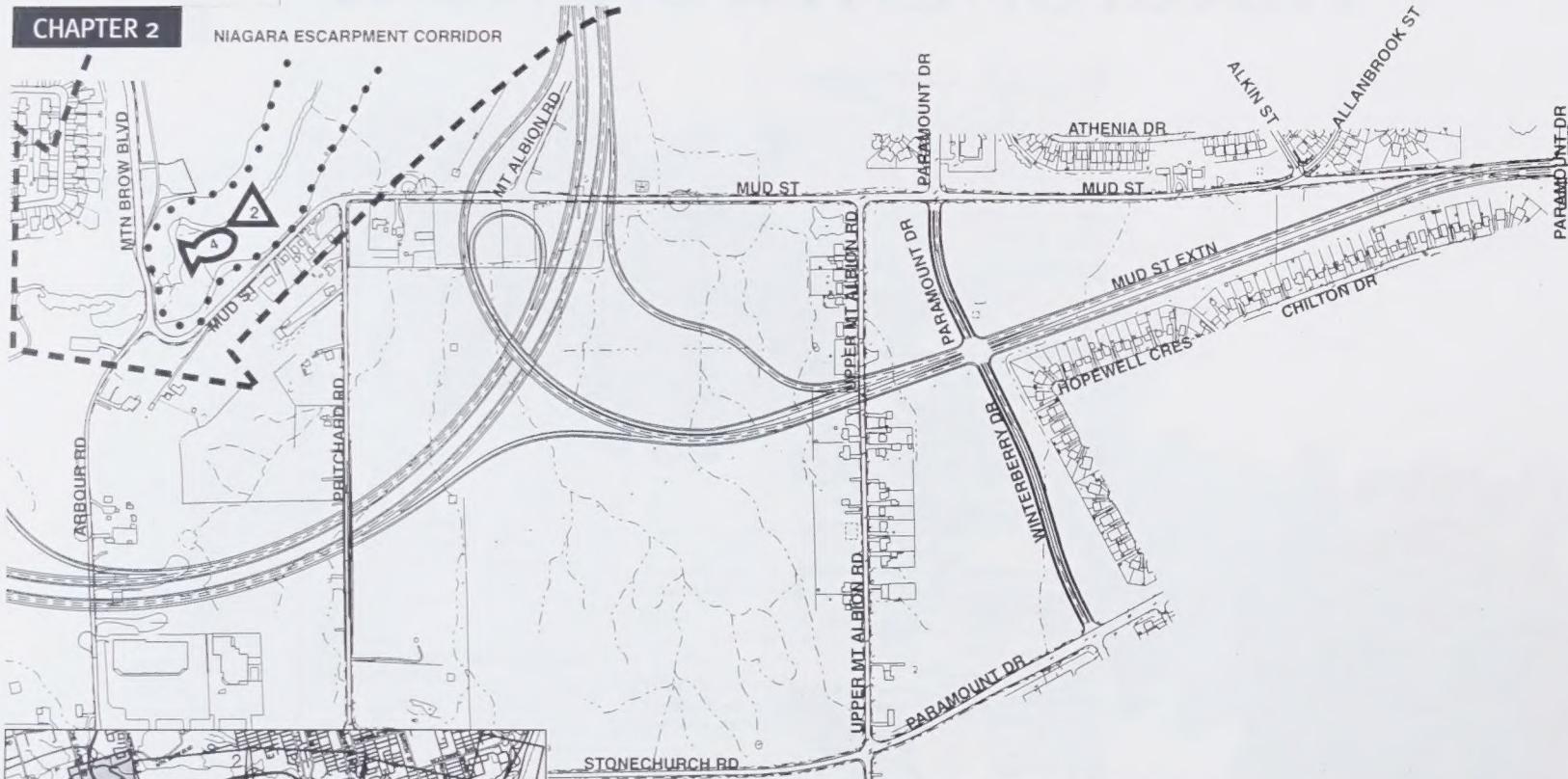
(2.3)
Natural
Environment



Natural Environment: Map 1

CHAPTER 2

NIAGARA ESCARPMENT CORRIDOR



MAP LEGEND

- Niagara Escarpment

FISHERIES

Fish Habitat (see text): between Queenston Rd. and Niagara Escarpment



TERRESTRIAL

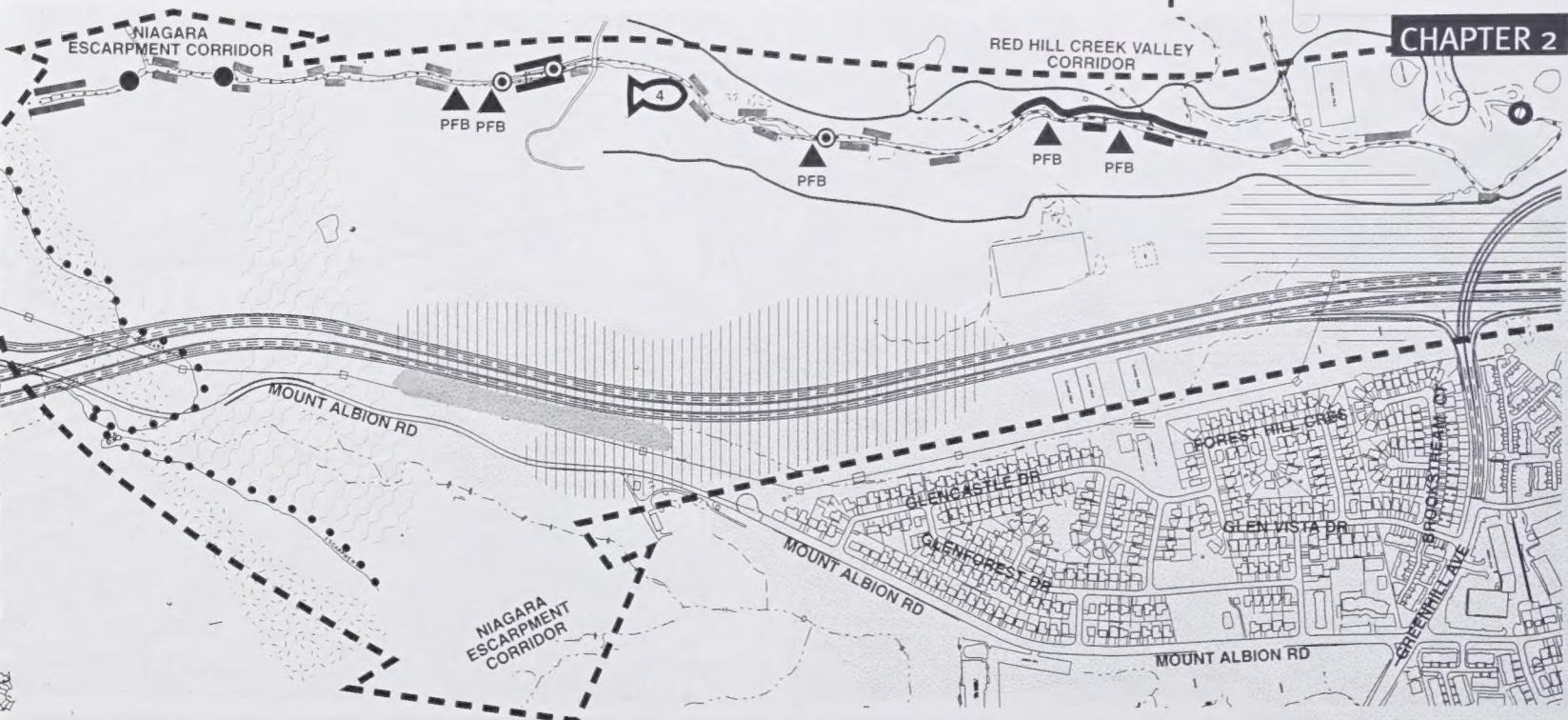
Primary Habitat Corridor (Niagara Escarpment)

△ Niagara Escarpment Complex Communities



Natural Environment: Map 2

CHAPTER 2



MAP LEGEND

- Niagara Escarpment
- ▲ Pedestrian Foot Bridge
- Low Sensitivity (to erosion)
- - - Moderate Sensitivity
- SURFACE WATER/WATER QUALITY
- Erosion Zones
- Erosion Protection Works (armourstone/gabions)
- Regulatory Floodplain Limits (without Expwy)
- Storm Outfall
- FISHERIES
- Fish Habitat (see text): between Queenston Rd and Niagara Escarpment

SURFACE WATER/WATER QUALITY

- Erosion Zones
- Erosion Protection Works (armourstone/gabions)
- Regulatory Floodplain Limits (without Expwy)
- Storm Outfall
- Erosion Protection Works
- Concrete Saddles

GROUNDWATER

- Potentially Sensitive Recharge/Discharge System (sand & gravel)
- Potentially Sensitive Recharge/Discharge System (bedrock)
- TERRESTRIAL
- Primary Habitat Corridors (Niagara Escarpment and Red Hill Creek Valley)

Mature Escarpment Forest: regionally significant plants; forest habitat linkage

Marsh Pockets (seepage zone): only remaining wetland habitat in upper valley

Dry Meadow Habitat: regionally significant plants; regionally rare butterfly species

Successional Habitat: regionally significant plants; regionally rare butterfly species



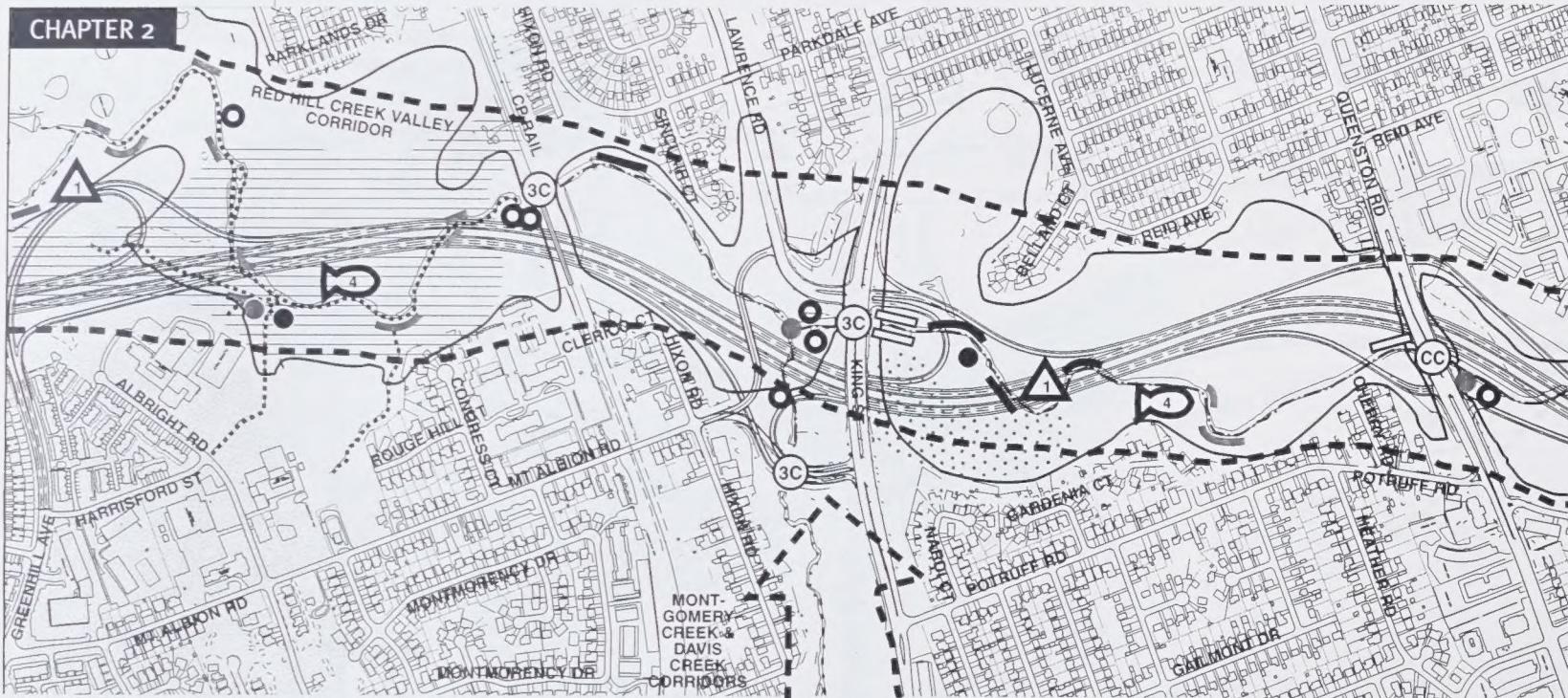
100m



9

Natural Environment: Map 3

CHAPTER 2



MAP LEGEND

- PFB
- STREAMS
 - Low Sensitivity (to erosion)
 - Moderate Sensitivity
 - High Sensitivity
 - Extreme Sensitivity

10

SURFACE WATER/ WATER QUALITY

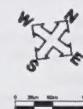
- CULVERTS
 - Triple Cell Culvert
 - Concrete Channel Culvert
 - Erosion Protection Works
- GROUNDWATER
 - Potentially Sensitive Recharge/Discharge System (sand & gravel)
- FISHERIES
 - Fish Habitat (see text): between Queenston Rd. and Niagara Escarpment
- EROSION PROTECTION WORKS
 - Erosion Zones
 - Erosion Protection Works (armourstone/gabions)
 - Concrete Lined Channel
 - Regulatory Floodplain Limits (without Envpyw)
 - Combined Sewer Outfall
 - Storm Outfall
 - Erosion Protection Works

TERRESTRIAL

- FOREST REMNANTS
 - Primary Habitat Corridor & Secondary Habitat Corridors (Montgomery Creek and Davis Creek)

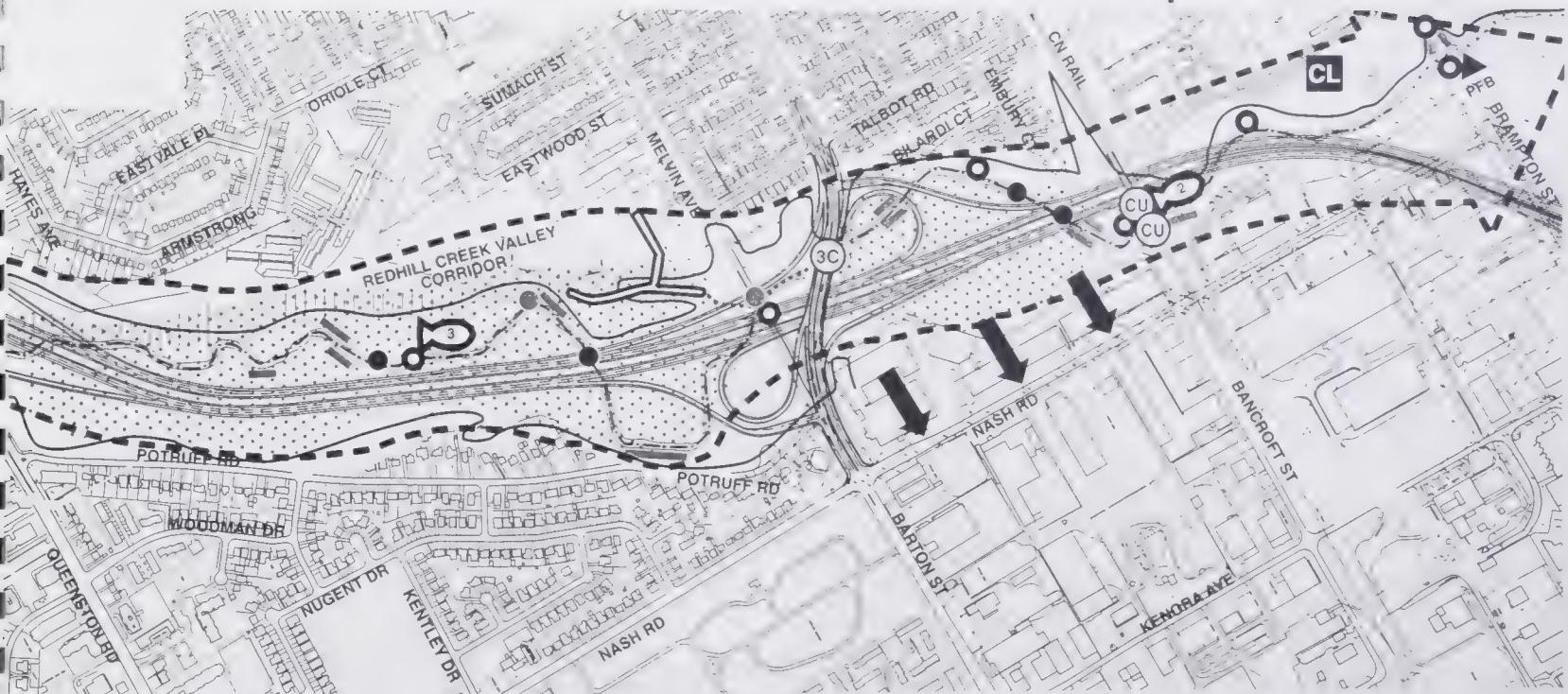
- MATURE FOREST
 - Mature Floodplain Forest: Carolinian species
 - Mature Slope and Floodplain Forest Remnants: Carolinian species; high biodiversity

Carolinian Floodplain Forest Remnants



1 KM

Natural Environment: Map 4



MAP LEGEND

- ▲ Pedestrian Foot Bridge
- STREAMS
 - Moderate Sensitivity (to erosion)
 - - - High Sensitivity
 - - - - Extreme Sensitivity
- CONTAMINATION
 - CL Closed Landfill Site

SURFACE WATER/WATER QUALITY

- Erosion Zones
- Concrete Lined Channel
- Regulatory Floodplain Limits (without Envpy)
- Combined Sewer Outfall
- Storm Outfall
- Erosion Protection Works
- Culvert
- Triple Cell Culvert



Spill



FISHERIES

- Fish Habitat (see text) between Windemere Basin and CNR tracks
- Fish Habitat (see text) between CNR tracks and Queenston Rd



TERRESTRIAL

- Primary Habitat Corridor (Red Hill Creek Valley)

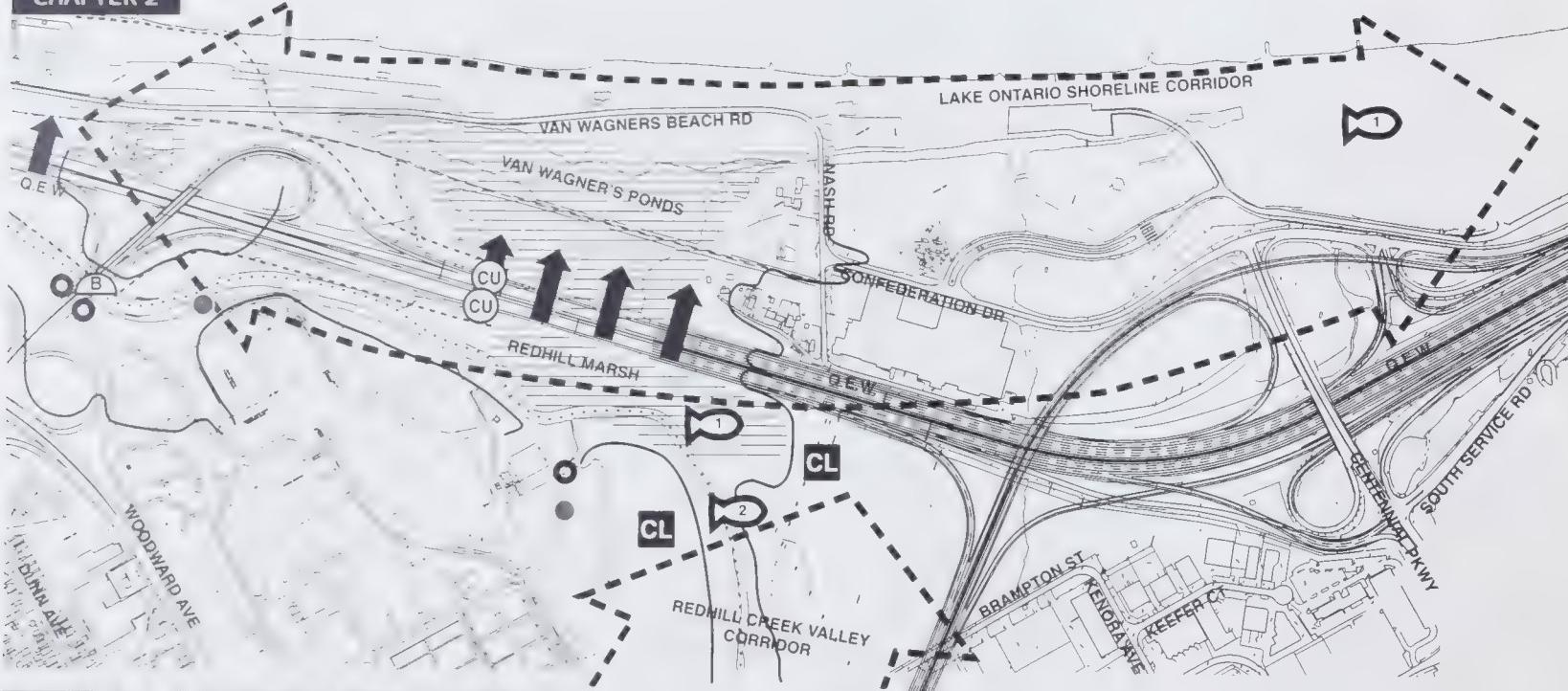
Mature Oak Slope Forests:

source of native plant propagates which support valley regeneration



Natural Environment: Map 5

CHAPTER 2



MAP LEGEND

- B Bridge
- STREAMS
- ... Low Sensitivity (to erosion)

SURFACE WATER/ WATER QUALITY

- Regulatory Floodplain Limits (without Expwy)
- Combined Sewer Outfall
- Storm Outfall
- Erosion Protection Works
- Culvert
- Spill

FISHERIES

- Fish Habitat (see text): in the Redhill Marsh/Van Wagner's Ponds area
- Fish Habitat (see text): between Windemere Basin and CNR tracks

- CONTAMINATION
- Closed Landfill Site

TERRESTRIAL

- Primary Habitat Corridor (Red Hill Creek Valley and Lake Ontario Shoreline)
- Provincially Significant Wetlands: regionally significant wildlife habitat (birds and amphibians), regionally significant plants, hydrologic dependence



Condition: Groundwater

Focus: Contribution that water found below the surface makes to the Red Hill Creek and local wetlands.

What is known:

- Most of the day-to-day low flow in the Creek comes from groundwater discharge above Albion Falls (above the Niagara Escarpment).
- There is generally very little groundwater discharging to Red Hill Creek below the escarpment with the exception of areas where surficial sand and gravels allow water to flow to the surface. These deposits may act as a local or intermediate groundwater recharge and discharge flow system.
- The recharge/discharge systems described above influence the level of the water table and groundwater discharge/recharge to/from the creeks and wetlands. The connection is minor and may only be potentially sensitive if recharge is substantially reduced in the areas presented on the preceding Map.
- If the existing recharge is maintained then impacts relating to groundwater linkages are not expected. Groundwater baseflow to the Creek may be enhanced.
- There is a minor area of bedrock outcropping above the escarpment which may also provide a local groundwater linkage to the Creek.

Key Legislation and Policy:

- Ontario Water Resources Act - deals with matters relating to stream diver-

sions and other groundwater related issues

- Environmental Protection Act - deals with matters relating to water quality and quantity amongst other environmental issues such as air and noise
- Water Management: Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy's Publication "Water Management"
- see other guidelines listed in the Exemption Order, 1996

Key Sources of Information:

1. Chapman, L.T. and D.F. Putnam, *The Physiography of Southern Ontario*, Ontario Geological Survey, Volume 2 270 pp., 1984
2. Feenstra, B.H., *Bedrock Topography of the Grimsby Area, Southern Ontario*, Ontario Geological Survey, Map P2401, 1981.
3. Feenstra, B.H., *Quaternary Geology of the Grimsby Area, Southern Ontario*, Ontario Division of Mines, Map P0993, 1975.
4. Ontario Department of Mines, *Drift Thickness Series, Grimsby Sheet, Southern Ontario*, Map P0536., 1969.
5. Ontario Ministry of Environment and Energy, *Electronic Water Well Database*, Regional Municipality of Hamilton-Wentworth, 1996.

(2.3)

Condition: Groundwater

Condition: Terrestrial Resources

CHAPTER 2

Focus: Plant and animal life, their supporting habitat, and relative significance

(2.3)

Condition: Terrestrial Resources

What is known:

- Natural vegetation includes mixed wood forests, wetland areas, and Niagara Escarpment woodlands.
- The valley floor is characterized by wetland areas, floodplains, and swamps. Forested riparian zones were once common along the valley floor, but have been replaced by urbanization and agriculture. The valley floor is characterized by wetland areas, floodplains, and swamps. Forested riparian zones were once common along the valley floor, but have been replaced by urbanization and agriculture.
- The Red Hill Creek corridor is the primary terrestrial corridor linking the Niagara Escarpment, the Lake Ontario Corridor, and the Niagara River Valley, and is important for biodiversity and ecological functions.
- The Red Hill Creek Valley is designated as a Provincial Ecological Reserve and a Natural Area of Scientific Interest.
- The Red Hill Creek Valley is designated as a Provincial Ecological Reserve and a Natural Area of Scientific Interest.
- Expressway construction has the potential to exacerbate many of the problems mentioned in the previous section, thus further impairing the ecological functions of Red Hill Creek.
- Physical concerns include steep slopes, erodible soils, and urban hydrology (see Surface Water). Biological concerns include: rare species and habitats, closed canopy forests, and vulnerable native plant and wildlife communities.
- Recreational use, industry, and residential development adjacent to the valley floor have had an existing impact on the local ecosystem.



Lake Ontario Corridor



Niagara Escarpment Corridor



Red Hill Valley Corridor
North/South of
Queenston Rd.

(2.3)

Condition: Terrestrial Resources

Key Legislation and Policy:

The protection of the environment from the potential impacts associated with expressway construction, falls under the umbrella of Federal and Provincial regulations.

- Canadian Environmental Assessment Act - may be triggered where federal approval is required for matters related to migratory birds.
- Migratory Birds Convention Act - must be complied with if migratory bird nesting habitat is impacted.
- Ontario Endangered Species Act - protects currently listed species and their habitats. At present, no listed endangered species are on record within the valley.
- The Niagara Escarpment Planning and Development Act - guides development on Escarpment lands including identified Escarpment Natural Areas.
- Ontario Planning and Development Act - provides guidance on the protection of Natural Heritage resources at the provincial, regional, and municipal levels.
- Provincial Wetland Policy - affects any development in the vicinity of the Van Wagner's Ponds and Red Hill Marsh, both are Provincially Significant Wetlands.
- Environmental policies of the Region and City of Hamilton affect any development within or adjacent to designated Environmentally Sensitive Areas.
- see other guidelines listed in the Exemption Order, 1996

Key Sources of Information:

1. Burr, L. *Summary of 1990 Breeding Bird Surveys in Hamilton-Wentworth Environmentally Sensitive Areas*. Hamilton Naturalists' Club, 1990.
2. Dobos, R.Z. *Natural Significance of Van Wagner's Ponds*. Wood Duck 42(9): 148-151. 1989.
3. Dougan, J. *Tree Preservation Plan. In: Mountain East-West & North-South Transportation Corridor - Landscape Management Plan*. Prepared for Moore/George Associates Inc. and the Regional Municipality of Hamilton-Wentworth, Ontario. 1989.
4. Ecologists Ltd. *Hamilton-Wentworth Region Environmentally Sensitive Areas Study*. Prepared for Hamilton Region/Grand River/Halton Region/Niagara Peninsula Conservation Authorities. 1976.
5. Ecoplans Limited. *Trans-Northern Pipeline - Kings Forest Park Pipeline Relocation - Environmental Impact Statement*. 1991.
6. Evans, L. *Noteworthy Bird Records: Red Hill Creek - Confederation Park, April 1947 - December 1994*. Prepared for Hamilton Naturalists' Club. 1995.
7. Geomatics International Inc. *Environmentally Sensitive Areas Development Sensitivity Study*. Prepared for Regional Municipality of Hamilton-Wentworth, Ontario. 1991.
8. Goodban, A. G. *The Vascular Plant Flora of the Regional Municipality of Hamilton-Wentworth, Ontario*. Hamilton Region Conservation Authority. 1995.
9. Goodban, A.G. *The Vegetation and Flora of the Red Hill Valley and Environs*. pp. 1766 in Hamilton Naturalists' Club (ed.), Prepared for the Hamilton Region Conservation Authority. 1995.
10. Goodban, A.G. *The Vegetation and Flora of Van Wagner's (Red Hill) Marsh*, Hamilton, Ontario. Prepared for Hamilton Region Conservation Authority. 1996.
11. Goodban, A.G. *A Survey of the Rare Vascular Plant Flora of the Albion Falls - Buttermilk Falls Area in the City of Hamilton*, Ontario. Prepared for Hamilton Region Conservation Authority. 1997.
12. Hamilton Naturalists' Club, Hamilton Region Conservation Authority, and Regional Municipality of Hamilton-Wentworth. *Hamilton-Wentworth Natural Heritage Database*. R.M. Hamilton-Wentworth Environment Department. 1996.
13. Hamilton Naturalists' Club. *Biological Inventory of the Red Hill Valley*, 1995. Prepared for Hamilton Region Conservation Authority, Hamilton, Ontario. 1996.
14. Heagy, A.E. (ed.). *Hamilton-Wentworth Natural Areas Inventory*, two volumes. Hamilton Naturalists' Club, Hamilton, Ontario. 1995.
15. Lamond, W. *The Reptiles and Amphibians of the Hamilton Area: An Historical Summary and the Results of The Hamilton Herpetofaunal Atlas*. Prepared for the Hamilton Naturalists' Club, Hamilton, Ontario. 1994.
16. Long Point Bird Observatory. *Marsh Bird Habitat Description and Monitoring Data for Van Wagner's Marsh*. LPBO, Port Rowan, Ont. 1996.
17. Moore/George Associates Inc. *Red Hill Creek Recreation and Open Space Master Plan*, City of Hamilton. 1994.
18. Ontario Ministry of Natural Resources. *Wetland Data Records for Red Hill Marsh and Van Wagner's Marsh*. 1990.
19. Patrkeev, M. *Breeding Birds of the Red Hill Valley*. Prepared for the Hamilton Naturalists' Club. 1995.
20. Regional Municipality of Hamilton-Wentworth. *Mountain East-West and North-South Transportation Corridor; Environmental Assessment Submission*. Regional Municipality of Hamilton-Wentworth Roads Department. 1983.
21. Regional Municipality of Hamilton-Wentworth. *Towards a Regional Greenlands System for Hamilton-Wentworth: Natural Heritage System Criteria*. R.M. Hamilton-Wentworth Planning Department. 1996.
22. Rose, P. *Red Hill Valley Spring Migratory Bird Survey*. Prepared for Hamilton Naturalists' Club. 1995.

Condition: Fisheries

Focus: Fish species, their habitat and relative significance

(2.3) Condition: Fisheries

What is known:

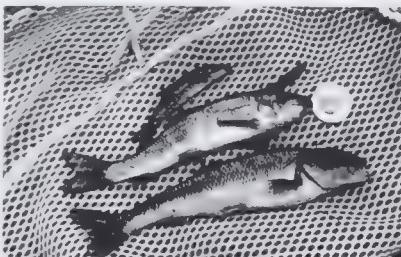
- Red Hill Creek can be divided into four principal sections. Each has a unique fish community which is influenced by physical barriers such as culverts and weirs over sewer pipes.
- The four sections are:
 1. The Marsh and Van Wagner's Creek section. This section is characterized by a large area of wetland habitat, with some areas composed largely of gravel, sand, and cobble. It provides habitat for nine common creek resident fishes, as well as temporary and spawning habitat for six fish species particular to Lake Ontario and Hamilton Harbour.
 2. Queenston Road to the Niagara Escarpment. This section consists of pool and riffle habitat, with substrates composed mainly of cobble and gravel. It provides habitat for seven species of creek resident fish, as well as spawning habitat for white sucker from Lake Ontario and Hamilton Harbour. The Queenston Road concrete channel and low weir, blocks the passage of some species at certain flow conditions from the lower sections of Red Hill Creek. A concrete saddle upstream of King Street is known to block the passage of spawning white sucker from Lake Ontario and Hamilton Harbour.
 3. The lower Red Hill Creek channel from Windermere Basin to the CNR tracks. This section of creek has no surface connection to the Creek, which means it does not connect to the Red Hill Creek system by two low weirs. Weirs in Red Hill Creek are generally too low to allow fish to access the Red Hill Marsh, except near the marsh's edge.
 4. Habitat degradation has been caused by the channelization of sections of creek, as well as the landfilling of the floodplain in some areas to make room for houses, industry and garbage dumps
 - Additional habitat degradation in the form of erosion and channel alteration has been caused by more frequent



Queenston Road Concrete Channel



The Region's fishery biologist releasing fish after sampling



(Top to bottom): Blacknose Dace; Longnose Dace; White Sucker; Creek Chub

(2.3)

Condition:
Fisheries

occurrences of high flow rates and volumes. This is due to development in the watershed which has resulted in increased runoff from city streets, parking lots, and roofs.

- Barriers to fish migration have restricted the utilization of Red Hill Creek as a spawning area for fish, and may have contributed to the local extinction of fish species.
- Pollution from urban runoff and sewage discharge has likely impacted the species diversity within Red Hill Creek.
- None of the aquatic species found are nationally, provincially or regionally rare
- Each unique aquatic habitat interacts with adjacent terrestrial habitats to contribute to the overall habitat diversity, and consequently the biodiversity, of the Red Hill Creek watershed. The creek and wetlands with their associated fish populations and other aquatic fauna, provide sources of food, water, and habitat for birds, mammals, reptiles, and amphibians that live in the Red Hill Creek valley. Along with other creeks and wetlands, the Red Hill Creek system provides spawning habitat for fish which live in to Hamilton Harbour and Lake Ontario, and thus is an important component of those larger ecosystems.
- Expressway construction has the potential to exacerbate many of the problems previously mentioned, thus further impairing the aquatic functions of Red Hill Creek.
- Storm runoff from the Expressway could

deliver pollutants to the Creek, as well as increase the local rate of erosion by altering the local discharge rates at input locations to the Creek.

- Expressway embankments and culverts may constrict the natural meandering of the creek, increasing flow velocities and altering flow direction in some areas, resulting in erosion and stress on the aquatic community.

Key Legislation and Policy:

- The protection of the aquatic environment from the potential impacts associated with Expressway construction, falls under the umbrella of Federal and Provincial regulations:
 1. Federal Fisheries Act ("No Net Loss" of Fish Habitat Policy)
 2. Canadian Environmental Assessment Act
- The principal legislation governing fish habitat is the Fisheries Act. The Fisheries Act states "no person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat" (Section 35(2)) without authorization by the Department of Fisheries and Oceans. As well, "no person shall deposit or permit the deposit of any deleterious substance into water frequented by fish" (Section 36(3)).
- The Department of Fisheries and Oceans Policy for the Management of Fish Habitat has the objective of creating a net gain of habitat for Canada's Fisheries resources. The goals of the

policy are

1. Maintain the current productive capacity of fish habitats supporting Canada's fisheries resources, such that fish suitable for human consumption may be produced
 2. Rehabilitate the productive capacity of fish habitats in selected areas where economic or social benefits can be achieved through the fisheries resource
 3. Improve and create fish habitats in selected areas where the production of fisheries resources can be increased for the social or economic benefit of Canadians.
- The guiding principle of Goal 1 is the "no net loss" principle, which requires that if the productive capacity of any fish habitat is reduced, then a compensating increase in fish production must be made to occur. The hierarchy of preferences for applying this principle is as follows:
1. Maintain, without disruption, the natural productive capacity of habitats through redesign or mitigation.
 2. If the former proves impossible or impractical, then compensation by either creating new habitat, or by increasing the productive capacity of existing habitat will be considered.
- It should be noted that the issuing of an Authorization under the Fisheries Act triggers the Canadian Environmental Assessment Act, so that approval by way of screening under this Act also becomes necessary.

Key Sources of Information:

1. Hamilton Conservation Authority. *Hamilton Region Conservation Report*, Department of Energy and Resources Management, 43 pp., 1968
2. Portt, C. and Associates. *Fisheries Assessment for Drainage Works Proposed in the Red Hill Creek Watershed Phase I Inventory and Overview of Concerns*, 20 pp., 1992
3. Staton, S., *Red Hill Creek Aquatic Inventory*, In Hamilton Naturalists' Club, *Biological inventory of the Red Hill valley*, p. 83-110., 1996

(2.3) Condition: Surface Water Levels

Condition: Surface Water

Focus: The impact storm events have on surface water (levels, velocities, volumes and rates) in Red Hill Creek and local tributaries.

What is known:

- The major stormwater outlets in the valley occur at Red Hill Creek (49 storm sewer outfalls and 9 combined sewer or sewage treatment plant outlets).
- Existing culverts, commercial and residential areas present specific challenges to the stream bed, significant backwater, and the amount of water that flows in the Red Hill Creek during storm events.
- Habitat changes due to the loss of natural areas due to industrial development and urban sprawl have replaced a substantial portion of the natural environment that once existed here. Land that used to moderate the flow in the creek by absorbing (or infiltrating) rainfall in the soil, is now covered with asphalt and concrete which prevents absorption (infiltration) into the soil and carries the runoff directly to storm sewers where it can empty into the Creek. The large volume of rainfall which now runs off in these areas of concrete and asphalt, in turn, causes water levels in the Creek to rise and fall rapidly.
- The Red Hill Creek flood plain (area where water goes over it floods over the creek bank) ranges from very broad relatively unconfined near the QEW, to very narrow highly confined between Brampton St. and the CNR, and then expands into a fairly broad flood plain (i.e., 100 - 200m width) upstream of the CNR within a deep valley.
- Primary locations and reasons, where



Bank full discharge



Low base flow



QEWS's low road profile

Condition: Surface Water Levels

- The rapid rate at which water flows in Red Hill Creek during storm events implies a public safety concern for activities in and/or adjacent to the creek.
- The size of culverts limits their ability to have carry stormwater under roadway crossings may lead to roadway washouts and severing of transportation corridors (i.e., QEW); in addition, flood levels in the valley are higher than would otherwise occur naturally.
- The lack of natural stormwater storage areas (wetlands, ponds, marshes) results in a stream system which has relatively rapid flow response, high runoff potential and lower baseflow rates.
- Some vegetation communities rely on the Red Hill Creek flooding its banks on a frequent basis. Notwithstanding, other types of vegetation are not so tolerant and hence have been negatively affected.
- The broad flood plain in many locations throughout the valley helps to slow stormwater, (ref. Streams) hence any changes to the floodplain as a result of the Expressway must take this fact into account.
- The low height of the QEW roadway relative to harbour and lake water levels contributes to its flood potential, hence, opportunities for improving the ability of the stream to carry flows are limited and costly. Alternative opportunities to mitigate potential flooding of the QEW involve building storage facilities in the upstream valley.
- Stormwater management strategies must be developed to an acceptable standard

to protect the Expressway, QEW and private property during rainfall events

Key Legislation and Policy:

- Riparian Law (Common law) - deals with property rights
- Lakes and Rivers Improvement Act - addresses the need to obtain a Certificate of Approval for stormwater management facilities
- Conservation Authorities Act and Regulations - addresses permits to develop, fill or grade areas within a floodplain
- Ontario Water Resources Act - addresses any temporary or permanent diversions within a water course and other stormwater issues
- Ministry of Transportation Directives (B-100,B-237)
- Municipal by-laws and standards
- see other guidelines listed in the Exemption Order, 1996

Environment Department Combined Sewer Overflow Abatement Program, 1995,1997

- Philips Planning and Engineering, "Red Hill Creek Watershed Plan - Surface Water Report (Draft)", July 1997
- Philips Planning and Engineering, "Mountain East-West, North-South Transportation Corridor Drainage Study", July 1989
- Philips Planning and Engineering, "Drainage Stabilization and Assessment Study Implementation Plan, Red Hill Creek", November 1992

Secondary

- Ministry of Environment and Energy , "Stormwater Management Practices - Planning and Design Manual", June 1994
- Ministry of Natural Resources, 1986, "Technical Guidelines for Flood Plain Mapping"
- Philips Planning and Engineering, "King Street Interchange - Detailed Hydraulic Analysis", August 1989

Key Sources of Information:

Primary

- Water Survey of Canada, "Fifteen minute, hourly and daily discharge data for Gauge 02HA014, and Gauge 02HA023", Environment Canada, 1988, 1995,1996, 1997
- Ontario Climate Centre, "Meteorological Data", Environment Canada, 1988,1990,1995,1996
- Regional Municipality of Hamilton-Wentworth, "Rainfall data"

Condition: Water Quality

Focus: Surface water pollution

(2.3) Condition: Water Quality

What is known:

- Red Hill Creek has the worst water quality of all the major tributaries to the Lower Ottawa River. The Red Hill Creek is one of the few streams which have some nutrients and organic matter inputs from general sewer (TWG) with no significant treatment. This is due to the lack of FATH informs, and the lack of a sewer system.
- Stream quality within the upper reaches of the Red Hill Creek is generally not better than in the surrounding areas. A future flow of wastewater may be caused to flow through the stream to address this concern.
- Stream water chemistry reflects the relatively low water quality inputs with possible exceptions of the groundwater inputs naturally within the Red Hill Creek.
- Certain chemicals naturally present at relatively high concentrations within the bedrock matrix of the Watershed, according, these chemicals are also present in the naturally occurring groundwater which contributes to
- Day-to-day low flow in the Red Hill Creek.
- Major sources of pollutants during storm events can be attributed to combined Sewer overflows, urban runoff, and stream bank erosion (which includes suspended sediment loads).
- During low flow pollutant sources include the Woodward Sewage Treatment Plant (lower reach only), nutrients from the upper watershed and likely inputs from the Upper Ottawa and Brampton Street landfills. The source of high coliforms under low flow is currently unknown.
- The source of in-stream water quality pollution is to a large extent, caused by water flowing from the surrounding sub-watersheds rather than from sources within the Red Hill Creek valley. Hence mitigation of these impacts would most appropriately be addressed through management techniques directed at the source of the pollutants or through Regional management facilities (i.e., constructed wetlands and/or ponds) downstream of the contributing areas (i.e. within the Red Hill valley).
- Due to limited opportunities to address pollutant loading at source, there may be requirements to create facilities within the Red Hill Creek valley and tributary valleys to address water quality concerns on a subwatershed scale. A proposed CSO abatement facility within the Red Hill Creek valley is an example of this approach.
- Development activities within the Red Hill Creek watershed and valley may



Combined Sewer Outfall (CSO)



Channel Bank Erosion



Woodward Avenue Sewage Treatment Plant

Condition: Water Quality

increase pollutant loadings to the Red Hill Creek, particularly suspended sediment, metals and PAH's.

- Activities within the Red Hill Creek valley may impact on existing closed landfill sites at Brampton St. and Rennie St. requiring specialized construction and remediation techniques to address potential water quality impacts
- Proposed CSO abatement remediation works will improve in-stream water quality, however, may impact on other resources within the valley.
- Construction of the CSO facility (pipe) will be incorporated at the same time as the Expressway.

Key Legislation and Policy:

- Federal Fisheries Act - must consider water quality effects on fish habitat
- Provincial Water Management Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy, 1994, and Canadian Water Quality Guidelines, 1993 - provides targets for in-stream water quality which are used to define health of the stream and define performance objectives for mitigation measures
- Guidelines for the protection and Management of Aquatic Sediment Quality in Ontario similar to water quality objectives, these guidelines provide targets for sediment within streams which are used to define the long term health of the stream.
- Stormwater Management Practices -

Planning and Design Manual , MOEE, 1994, provides design guidance for mitigation of water quality impacts due to urban development.

- Ontario Water Resources Act (see Surface Water)
- see other guidelines listed in the Exemption Order, 1996

Key Sources of Information:

Primary

1. Heagy, A.E., 1995. Hamilton-Wentworth Natural Areas Inventory, Volume 1, Hamilton Naturalists' Club. Prepared for the Hamilton Region Conservation Authority.
2. Aquafor Beech Ltd., 1997. Class EA: Red Hill Creek CSO control, ESR Draft Report. Prepared for the Regional Municipality of Hamilton-Wentworth.
3. Ng, Howard & Jim Marsalek, 1988, "Stormwater Discharges to Hamilton Harbour", Bae,
4. G., F. Lee, G. Sorger, , R.F. Io and O. Zaimi, 1994. Red Hill Creek Survey: Summer 1994.
5. Lee, F. R. Martinez, G. Sorger, A. MacDougall, and J. Pullen, 1995. Report on Contamination Entering Chedoke and Red Hill Creek: Summer 1995.
6. Marchewka, K., G. Sorger, R. Martinez, and H. Nahal, 1996. Report on Contamination in the Davis Creek Watershed and in the Effluent of the Woodward Sewage Treatment Plant: Summer 1996.
7. McCarry, B., February 1996. *Red Hill Creek as a Source of Genotoxins to Hamilton Harbour*
8. Ministry of Environment and Energy, 1995. *Water Quality Monitoring Network, Data for Red Hill Creek in digital format, 1964 to 1991*
9. Paul Theil Associates Ltd and Beak Consultants Ltd., 1991. *Regional Municipality of Hamilton-Wentworth Pollution Control Plan*
10. Snodgrass, W.J., 1981. *Hamilton Harbour Study – Material Inputs to Hamilton*. Report to Ministry of Environment and Energy, Water Resources Branch
11. Staton, S. 1996. *Red Hill Creek Aquatic Inventory*. In Hamilton Naturalists' Club, 1996
12. Biological inventory of the Red Hill valley. Prepared for the Hamilton Region Conservation Authority, April 1996.
13. Wenghofer, C. 1997. *Red Hill Creek: Water and Sediment Quality, and Effects on Fish and Fish Habitat – Final Draft Report*. Prepared for the Red Hill Valley Environmental Rehabilitation Project.
14. Philips Planning and Engineering, "Red Hill Creek Watershed Plan - Water Quality Report (Draft)", July 1997

Secondary

1. Maltby, L., D.M. Forrow, A.B.A. Boxall, P. Callow and C.I. Betton. 1995a. *The Effects of Motorway Runoff on Freshwater Ecosystems. 2. Identifying Major Toxicants*. Environmental Toxicology and Chemistry. 14: 1093-1101. In Wenghofer, 1997
2. Marsalek, J., B. Brownlee, T. Mayer, S. Lawal and G. Larkin, 1997. *Heavy Metals and PAHs in Highway Bridge Runoff*. Prepared for the National Water Research Institute.
3. Ministry of Environment and Energy, 1993. *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario*. Ontario Ministry of Environment and Energy.
4. Ministry of Environment and Energy, 1994. *Water Management Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy*. Queen's Printer for Ontario. Toronto, Ontario.
5. Ministry of Environment and Energy, 1994. *Ontario Drinking Water Objectives, Revised 1994*. Ontario Ministry of Environment and Energy, Queen's Printer for Ontario. Toronto, Ontario.
6. Ministry of Environment and Energy, 1994. *Ontario Drinking Water Objectives, Revised 1994*. Ontario Ministry of Environment and Energy, Queen's Printer for Ontario. Toronto, Ontario.

Condition: Streams

CHAPTER 2

(2.3) Condition: Streams

What is known:

- The portion of Red Hill Creek from Barton Street to the discharge point at Windermere Basin has experienced significant stream movement over the past 100 years as a result natural processes and substantial changes to the stream as a result of public works and bridge crossings. This section of the stream is actively eroding at rates considered normal for the given topography, vegetation and geology of the immediate area.
- The portion of Red Hill Creek from Barton Street to the discharge point at Windermere Basin is relatively stable. This backwater area from Lake Ontario experiences high rates of sediment deposition which is typical for areas like this.
- Due to a combination of the current instability of the stream channel, sections of the Red Hill Creek can be expected to continue to erode at unnaturally high rate regardless of whether additional development occurs in or adjacent to the Valley.
- Urban land use has increased the frequency and amount of runoff resulting in increased erosion and channel instability.
- Riparian vegetation is an important factor in the stability of natural channel reaches within the Red Hill Creek.
- Culvert and bridge crossings and channelization works have locally increased stream flow velocities and erosion rates downstream of crossings.
- Building beside an unstable creek.
- Applying natural channel design principles.



Example of concrete channel



Example of "gabion" channel / erosion protection



example of channel bank erosion

- Developing solutions that will allow the creek and the Expressway to co-exist

Key Legislation and Policy:

- Federal Fisheries Act (see Fisheries)
- Lakes and Rivers Improvement Act (see Surface Water)
- Conservation Authority Act and Regulations (see Surface Water)

Key sources of information:

Primary

1. DiCrescenzo, R., D. Hatanalika, W. Lee, 1996, *Fluvial geomorphology study of Red Hill Creek*, B.A. Thesis, Department of Geography, McMaster University, Hamilton, Ontario, Canada.
2. Environment Canada, 1990, *Fifteen minute stage/discharge data: Gauge Q2HA014 (Red Hill Creek at Hamilton)*, Environment Canada, Monitoring and systems branch, Guelph, Ontario.
3. Ferklo, D., In progress, *Erosion characteristics of Red Hill Creek*, Unpublished M.Sc. Thesis manuscript, School of Engineering, University of Guelph.
4. Stead, V., 1996, *Channel erosion in the upper Red Hill Creek Valley*, B.A. Thesis, Department of Geography, McMaster, University, Hamilton, Ontario, Canada.
5. WRIS (Water Regime Investigations and Simulations Ltd.), In Progress, *A Fluvial Geomorphologic Inventory of Red Hill Creek and its tributaries*, Waterloo, Ontario, Canada

Secondary

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2. Annable, W.K., 1995b, *Database of morphologic characteristics of watercourses in southern Ontario*. Ontario Ministry of Natural Resources, Interim Report
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CHAPTER 2

Notes &
Thoughts

Human Settlement

CHAPTER 2

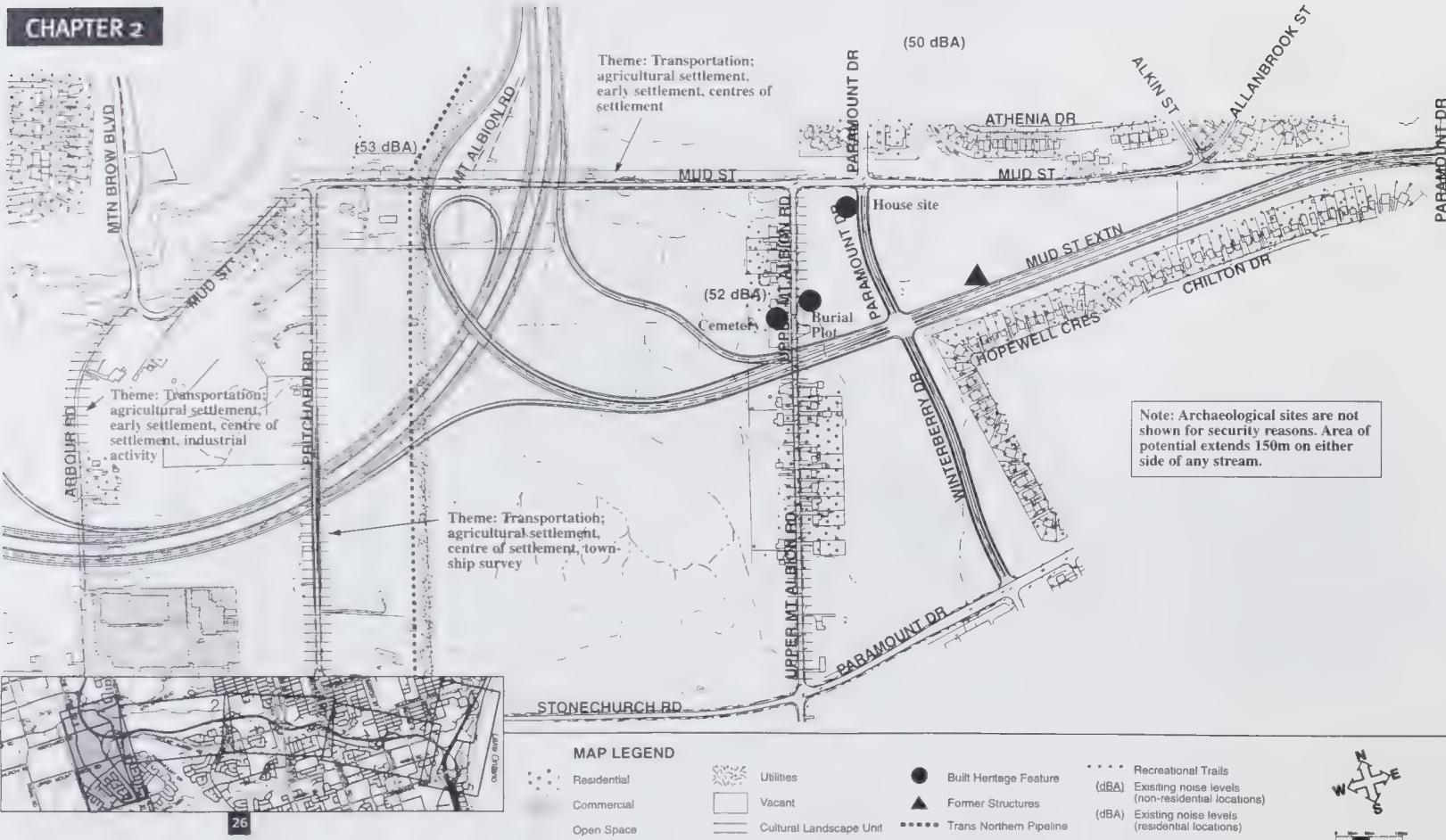
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Human
Settlement



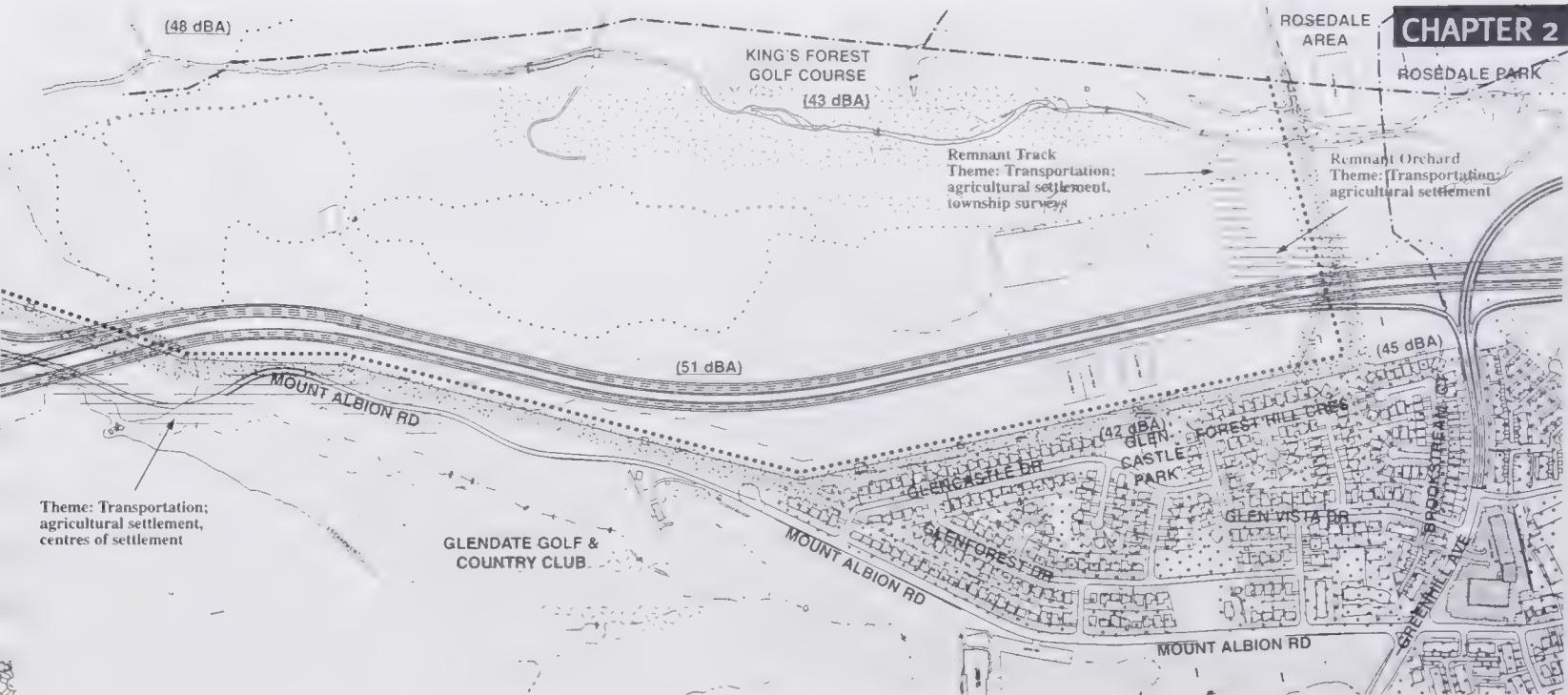
Human Settlement: Map 1

CHAPTER 2



Human Settlement: Map 2

CHAPTER 2



MAP LEGEND

Residential
Commercial
Open Space

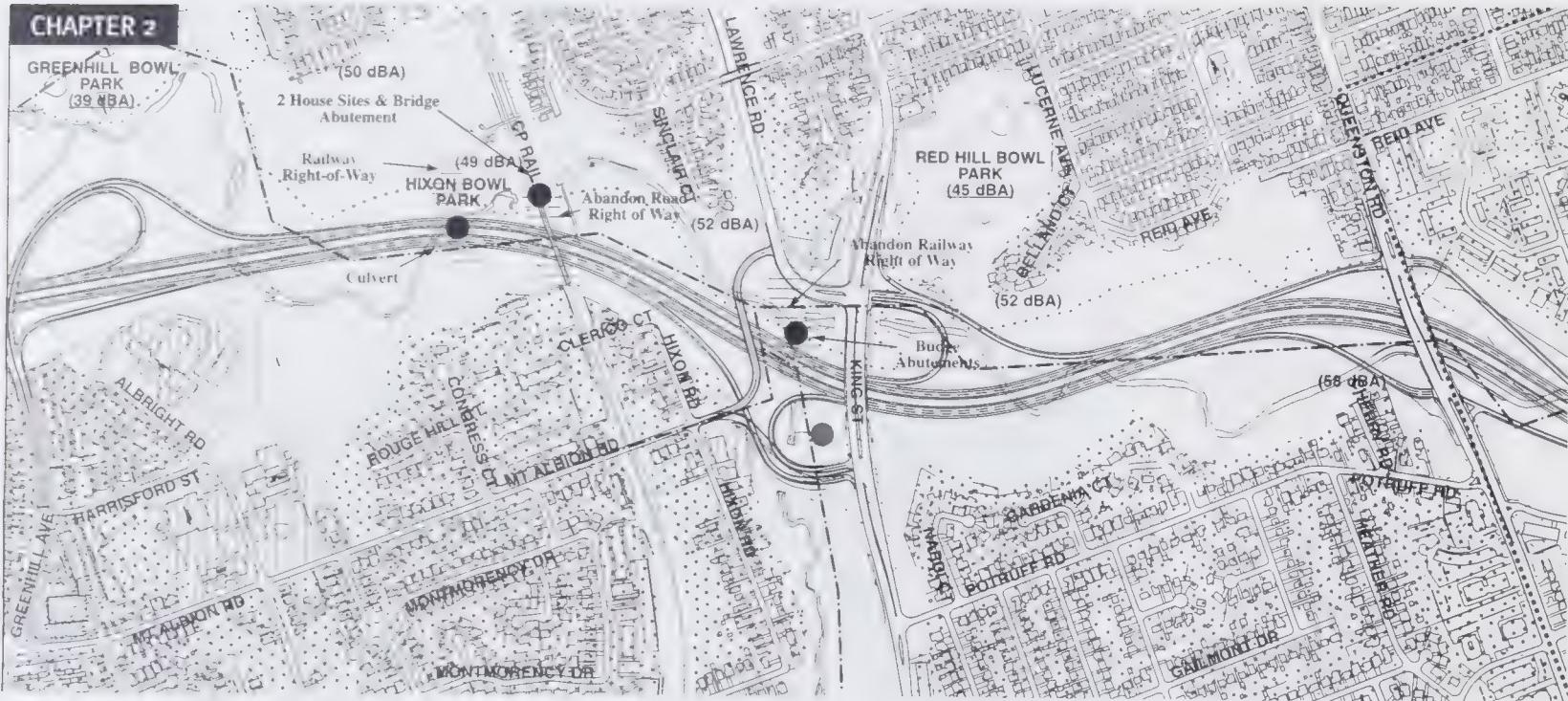
Open Space (Golf Course) ••••• Trans Northern Pipeline
Utilities
Vacant
Cultural Landscape Unit

(dBA) Existing noise levels
(non-residential locations)
(dBA) Existing noise levels
(residential locations)



Human Settlement: Map 3

CHAPTER 2



MAP LEGEND

Residential	Utilities	(dBA) Existing noise levels (non-residential locations)
Commercial	Vacant	(dBA) Existing noise levels (residential locations)
Institutional	Cultural Landscape Unit	
Open Space	Recreational Trails	
	Built Heritage Unit	
	Bell Canada	
	Sanitary Sewer	
	Recreational Trails	
	Built Heritage Unit	



Human Settlement: Map 4

CHAPTER 2



MAP LEGEND

	Residential		Industrial		Former Waste Disposal Site		Sanitary Sewer
	Commercial		Vacant		Former Waste Disposal Site (unknown size)		Union Gas
	Institutional		Cultural Landscape Unit		Built Heritage Unit		Existing noise levels (non-residential locations)
	Open Space		Recreational Trails		Existing noise levels (residential locations)		Scale Bar



Human Settlement: Map 5

CHAPTER 2



MAP LEGEND

Residential
Commercial
Institutional
Open Space

Industrial
Vacant
Utilities
Cultural Landscape Unit

Built Heritage Unit
Former Waste Disposal Site
Former Waste Disposal Site (unknown size)
Bell Canada

Recreational Trails
Sanitary Sewer
Union Gas
(dBA) Existing noise levels (non-residential locations)
(dBA) Existing noise levels (residential locations)



Condition: Private/Public Property

Focus: Lands required to build the Expressway

CHAPTER 2

(2.3)

Condition:
Private/Public
Property

What is known:

- Land in the Red Hill Valley and along the QEW is primarily owned by the City of Hamilton, Region of Hamilton-Wentworth and Province of Ontario
- Land in private ownership is generally used for commercial or industrial purposes
- Land in private ownership required to build public sector projects like the Expressway will be purchased at fair market value
- If a negotiated agreement for private property cannot be reached, public sector proponents can expropriate
- In keeping with the Expressway construction schedule (target completion date - 2002), steps to ensure that lands are acquired in a timely manner will begin once a preferred Expressway alignment is set.

Key Legislation and Policy:

- Ontario Expropriations Act - enables public bodies to acquire land that serves the public interest
- Municipal Act - deals with Municipal property acquisition

Key Sources of Information:

1. Property Assessment Records

Condition: Land Use & Infrastructure

CHAPTER 2

Focus: Existing/future land use and transportation/utilities

(2.3)

Condition: Land Use and Infrastructure

What is known:

- The Rosedale Secondary School is located at the South West End of Red Hill Creek.
- The Rosedale area is located between the expressway and Main Street. It contains residential areas, a school, and access to the Galt Road transit system.
- The expressway SWAR facility is located just to the east of the Rosedale area.
- The Rosedale area is located in the Keweenaw Valley, which has two watercourses that cross the expressway and include the Rosedale Creek, the Rosedale Trail, Northern Escarpment Trail, Hamilton Mountain, and a major stormwater system. The major sanitary sewers and combined sewer overflows run through the valley under the expressway (e.g., Winter Creek). An undercrossing is planned for the SWAR facility. Wastewater Treatment City was recently built across Red Hill Creek.
- Transportation infrastructure present outside the study area can be within the jurisdiction of the Ministry of Transportation (MTO), the Region of Hamilton-Wentworth (Burlington St., Queenston Parkway, Woodward Ave., Neil St., Barton St., Queenston Rd., Erie St., and Mud St.) City of Hamilton/City of Stoney Creek (all other municipal roads) Canadian National Railway (Grimsby subdivision) and Canadian Pacific Railway (TH&B).
- According to the Watershed report, a network of on and off-street walking trails will help transport people to and through this area (i.e., Bruce Trail, Waterfront Trail, and other multi-use trails located along Red Hill Creek)
- A Red Hill Creek Recreational Master Plan was developed by the City of Hamilton in 1989 but has not been implemented except for portions of the trail network.
- The Hamilton Region Conservation Authority is expected to approve in November a Master Plan for Confederation Park in November.
- Other planning documents of relevance to the study area include: Niagara Escarpment Plan, Regional Official Plan, City of Hamilton Official Plan, and City of Stoney Creek Official Plan.
- The Region has plans to build a combined sewer overflow pipe under the Expressway. The pipe will extend along the Valley from Lawrence Road to the CNR tracks. Alignment details will conform to the Expressway's final design.
- Steps to mitigate potential slope failure at the Ottawa Street landfill are being investigated.
- A minor sewerline carrying sanitary waste from Hamilton Mountain and parts of Stoney Creek runs underneath a substantial portion of Red Hill Creek.



Rosedale area



King Street crossing



Queenston Road crossing

(2.3)**Condition:
Land Use and
Infrastructure****Key Legislation and Policy:**

- National Transportation Act - compliance to ensure rail access is maintained
- Navigable Waters Protection Act - compliance to ensure water access is maintained
- Canadian Environmental Assessment Act - may be triggered by the aforementioned Acts
- Public Transportation and Highway Improvement Act - to obtain permits associated with provincial highways and structures
- Municipal Act - governs municipal highways and bridges
- Municipal Official Plans - govern land use and infrastructure

Key sources of information:**Region of Hamilton-Wentworth**

- Official Plan (1995)
- Regional Transportation Review
- Regional Bicycle Master Plan (1992)
- Red Hill Creek Expressway North-South Section Exemption Order
- Red Hill Creek CSO Control Class Environmental Assessment - Environmental Study Report
- Region of Hamilton-Wentworth Class Environmental Assessment - Red Hill Creek CSO Control (Draft Environmental Study Report) Aquafor Beech Ltd., July, 1997

City of Hamilton

- Official Plan (Currently under review)
- Neighbourhood Plans
- Red Hill Valley Recreation and Open Space Master Plan (1989)

City of Stoney Creek

- Official Plan (Currently under review)
- Recreation and Culture Master Plan
- Multi-Use Pathway, Pedestrian and Cycling Route Master Plan Study (1995)

Hamilton Region Conservation Authority

- Digital Trails Map
- Confederation Park Master Plan Draft

**Waterfront Regeneration Trust,
Red Hill Valley Restoration
Project, Mapping****Region of Hamilton-Wentworth
and the City of Hamilton
Bikeways and Parks Map (1996)**

Condition: Cultural Heritage

CHAPTER 2

Focus: Archaeological, built heritage and cultural landscape features

(2.3)

Condition: Cultural Heritage

What is known:

- The Red Hill Creek watershed has undergone significant changes in the area of the proposed site and valley. The valley is characterized by a mix of agricultural and natural areas. The valley floor is characterized by a mix of agricultural and natural areas. The valley floor is characterized by a mix of agricultural and natural areas.
- A total of 13 archaeological sites have been identified along the 1.5 km stretch of the Red Hill Creek Valley. The majority of these sites are located as a result of the construction of part of the Canadian Pacific Railway and work related to the Espro Mine. These include three large structures ranging between 32 and 100 m in length, prehistoric sites that may have reflected any specific purpose, and the remains of a small prehistoric campsite located near the mine.
- The cultural heritage of the Valley is an important element in the type of resources that make up the built heritage features and cultural landscape. During the cultural heritage assessment for the expressway, a total of 13 built heritage features and 13 cultural landscape features were identified, all of which are considered to be of heritage value either individually or as part of the overall resource and integrity of the valley and its waters. These are detailed below.

• The built environment includes crossings and road culverts, bridges and abutments, or other related built-in agricultural set backs. These areas are in the form of a linear form stand, remnant orchards, and cemeteries.

• The cultural heritage resources that survive within the Red Hill Creek valley are the tangible remains of our history, which tell us who we are and what we are now. They also enhance the environmental diversity of the area and provide continuity within the changing landscape. These resources are both fragile and non-renewable.

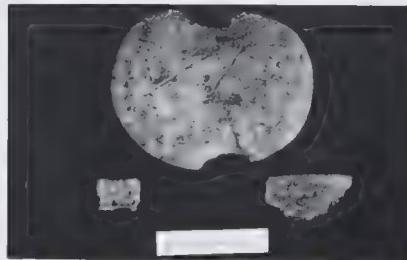
• In the inevitable process of change and growth, cultural heritage resources may be affected in several ways. These effects may be both beneficial and harmful, depending upon the degree to which they are sensitively controlled. Negative impacts upon heritage resources must be either averted or minimized, either through ensuring that change has no adverse impacts, or that intervention in the process will result in the promotion of beneficial effects.



Red Hill Creek Valley Road



Canadian National Culvert
No. 2



Selected Artifacts from the Recliner Site

Key Legislation and Policy:

- Planning Act (1996)
- Environmental Assessment Act (1990)
- The Niagara Escarpment Plan (1994)

Key Sources of Information

1. Archaeological Services Inc., Unterman, McPhail, Cumming Associates and Historica Research Limited 1997, *The Red Hill Creek Watershed Plan: Cultural Heritage Resources Technical Report*. Draft report submitted to the Regional Municipality of Hamilton-Wentworth
2. Ontario Heritage Policy Review, 1990, *The Strategy for Conserving Ontario's Heritage: The Report of the Ontario Heritage Policy Review*. Ministry of Culture and Communications, Toronto. (see State of the Watershed Report)

Condition: Known & Potential Contaminant Sources

Focus: The type and extent of known and potential contaminant sources

(2.3)

Condition: Known and Potential Contaminant Sources

What is known:

- Major contamination is anticipated in the area north of Barton Street. This area includes the former Brampton Street landfill.
 - Surrounding land use is primarily agricultural and residential.
 - The former Municipal Airport was adjacent to the west of the study area north of Melvin Avenue. Available historical information indicates that airport is not expected to have impacted the study area.
 - 2. The remains of old wells and/or septic systems may be present at the locations of former structures in the area of the Mud Street interchange and on Melvin Street.
 - 3. Contaminated sediments may be present downstream of the storm sewer and combined sewer outfalls.
 - 4. There is a buried oil pipeline in the hydro corridor that intersects the study area between Paramount Drive and Greenhill Avenue. There have been no known leaks in the oil pipeline.
 - 5. Debris, including derelict motor vehicles, has been deposited at a number of locations throughout the valley.
 - Contamination is expected to be present in the portion of the study area north of Barton Street.
- The area has been used for industrial and landfilling activities since the 1950s. It includes three automobile scrap yards and a former furniture manufacturer. At one time areas were formerly used for waste disposal.
- Surrounding land use is primarily industrial. The former Brampton Street landfill is adjacent to the east side of the study area north of Brampton Street.
- Much of the land where contamination is anticipated is privately owned. Potential contamination can only be confirmed on public owned property.
 - On-going activities on some of the properties where contamination is expected may increase the extent of contamination.
 - The limited intrusive investigations that have been completed in the area have identified that the contaminated areas may be underlain by low permeability soils and relatively shallow bedrock which can minimize contaminant movement below ground.
 - The expressway alignment south of Barton Street should not encounter major contamination. North of Barton Street, major contamination may be encountered. It is likely that this contamination can be managed either by removal, treatment or controlling in-place. Through careful planning, adverse environmental impacts can be avoided.



Site Contamination

Condition: Known and Potential Contaminant Sources

Key Legislation and Policy:

- Ontario Environmental Protection Act and Regulations under the Act, particularly Regulation 347 (Waste Management)
- Ontario Water Resources Act
- Gasoline Handling Act and Energy Act
- Ontario Environmental Bill of Rights
- Ministry of Environment and Energy's Guideline For Use At Contaminated Sites In Ontario
- Ministry of Environment and Energy's Policy For The Management Of Excess Materials In Road Construction
- Occupational Health and Safety Act

Key Sources of Information:

1. Conestoga-Rovers & Associates, Brampton Street Landfill Investigation Final Report, Mountain East-West and North-South Transportation Corridor, April 1990.
2. M. M. Dillon Limited, Environmental Investigation, 409 Nash Road North, April 1995.
3. M. M. Dillon Limited, Region of Hamilton-Wentworth, Liability Assessment of Regional Facilities, July 1995.
4. Golder Associates Limited, Geotechnical Infill Programme North-South Parkway Hamilton-Wentworth Ontario, Golder Report No. 881-1416-1, March 1989.
5. Golder Associates Limited, Geotechnical Investigation Rennie Street Landfill North-South Parkway, Golder Report No. 881-1416-A, March 1989
6. Jagger Hins Limited, Leachate Management System Assessment Former Brampton Street Landfill, October 1994
7. Ministry of Environment and Energy, Inventory of Coal Gasification Plant Waste Sites in Ontario, Volumes 1 and 2, 1988.
8. Ministry of Environment and Energy, Inventory of Industrial Sites Producing or Using Coal Tar and Related Products in Ontario, 1 and 2, 1989.
9. Ministry of Environment and Energy, Waste Disposal Site Inventory, 1991.
10. Morrison, Beatty Limited, Hydrogeological Assessment of Brampton Street Landfill Site Region of Hamilton-Wentworth, December 1980.
11. Personal Communication, Mr. Carl Slater, Ministry of Environment and Energy, Hamilton District Office.
12. Peto Associates Limited, Soil Investigation Report Proposed 90" Trunk Water Main, July 1969.
13. Peto Associates Limited, Soil Investigation Report Proposed 90" Trunk Water Main Brampton, Rennie Sts. & Nash Road, 1969.
14. Proctor & Redfern Limited, Development of a Comprehensive Environmental Monitoring Program for the Open and Closed Landfill Sites Within Regional Jurisdiction, 1994.
15. Regional Municipality of Hamilton-Wentworth, Regional Environment Department, Report to Environmental Services Committee on Remedial Action Program: Closed Landfill Sites, (ENV 96-094), September 23, 1996

Condition: Visual Resource (Niagara Escarpment)

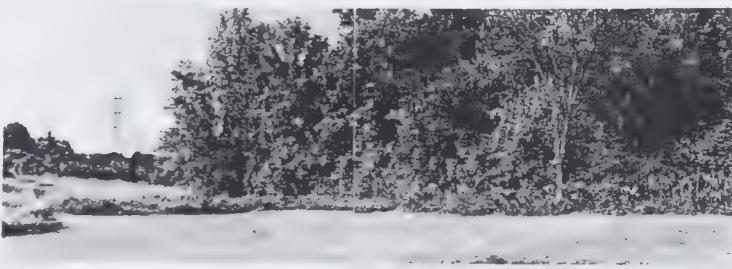
Focus: The Expressway crossing of the Niagara Escarpment

(2.3)

Condition:
Visual Resource
(Niagara
Escarpment)

What is known:

- A visual resource assessment was conducted in 2007 to determine the potential impact of the proposed expressway on the visual resources of the Niagara Escarpment. The visual resources considered were the Niagara Escarpment, the Niagara River, and the surrounding residential areas.
- The visual resource assessment found that the proposed expressway would have a significant negative impact on the visual resources of the Niagara Escarpment. This is due to the fact that the expressway would be located in close proximity to the escarpment, which would result in a loss of scenic views and a reduction in the quality of the views.
- The visual resource assessment also found that the proposed expressway would have a significant negative impact on the visual resources of the surrounding residential areas. This is because the expressway would be located in close proximity to these areas, which would result in a loss of scenic views and a reduction in the quality of the views.
- A simple impact analysis has been conducted to determine the impact of the proposed expressway on the visual resources of the Niagara Escarpment. This includes:
 1. The residential landscape view from residential backyards on Mount Albion Road.



View from residential backyards on Mount Albion Road



View from Mountain Brow Boulevard



View from King Forest Golf Club clubhouse terrace

(2.3)**Condition:
Visual Resource
(Niagara
Escarpment)**

- from golf course greens
- 2. Roadway and Trail Corridor Landscapes - view from Mountain Brow Boulevard
- 3. Residential/Neighbourhood Landscapes - view from backyards on Mount Albion Road

Process:

- In order to document all potential vantage areas within this complex viewshed, and to assess their relative degree of visual sensitivity to the development proposal, a combination of field-generated mapping diagrams and photography have been used in association with a 3-D model of the valley terrain. This computer generated model, or DTM (Digital Terrain Model) includes a projected diagram of the expressway crossing alignment as it potentially will set in the existing landscape.

Key Legislation and Policy:

- A "moving viewshed" will be prepared illustrating the structure of the landscapes, inclusive of vegetation groupings, towers, existing buildings, trails and roadways. More detailed animation and landscape enhancements will grow over the course of the phased impact study. The initial visual assessment analysis and computer modelling will not end at Phase 1 and 2 as a completed technical document, but rather will be used to inform and examine design and visual mitigation options in future phases of expressway conceptual development.
- The consultants are currently summa-

rizing the viewshed as a series of landscape settings or units, each with its own features and characteristics, as well as, completing the initial wire frame model of the viewshed. This work and assessments of the project visibility will be presented at stakeholder workshops. Key representative views from landscape units and of the critically impacted areas within the viewshed will also be presented at this time in graphic and photographic form for public discussion. It is the intention of the consulting team to involve workshop participants in evaluating the relative sensitivity of landscapes to expressway impacts, using the baseline landscape inventory prepared as a part of this phase of work. Preliminary options for reducing visual impacts of the preferred alignment crossing will be discussed as well.

Key Sources of Information:

1. Hough, Woodland, Naylow and Dance. Fieldwork.

Condition: Air Quality

CHAPTER 2

Focus: Changes in vehicle related emissions

(2.3)

Condition: Air Quality

What is known:

- The most significant source of air pollutants in an urban environment is typically vehicular traffic, including cars, buses, light duty and heavy duty trucks.
- Pollutants of concern are carbon monoxide (CO), nitrogen oxides (NO_x), and particulate matter (PM).
- Present air quality conditions within the Valley will be determined through a six month monitoring program initiated recently. A monitoring station has been situated within the King Street intersection, a location which is expected to experience one of the greater impacts from vehicular traffic. The monitoring station will measure Total Suspended Particulate (TSP), respirable dust (PM₁₀), Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs). Meteorological conditions such as wind speed, wind direction, and temperature will be continuously measured. Monitoring will also be conducted once the expressway is operational, to determine whether predicted impacts have proven true.
- Data from existing MOEE monitoring stations across Hamilton will also be examined to establish baseline air quality conditions. Figure A shows the locations of eleven monitoring stations presently operated by the MOEE which are in the general vicinity of the study area (see also Watershed Report). Note that seven monitor TSP only.
- The report of the Hamilton-Wentworth Air Quality Initiative was released in October. The document was prepared

by researchers from McMaster University and the regional, provincial and federal government and addresses the overall state of air quality in the Hamilton Harbour watershed. The Region is investigating ways it can promote improved air quality. Staff working on the Expressway project will be seeking advice from within the Region and community participants.

Key Legislation and Policy

• Environmental Protection Act, Regulation 337 - there are no regulatory standards for roadway emissions; however, during the environmental assessment (EA) process, the MOEE typically assesses the impact of a proposed roadway undertaking by comparing predicted pollutant levels from the undertaking to ambient air quality criteria (AAQCs). The AAQCs are desirable levels, specified under Regulation 337 of the Environmental Protection Act. There are AAQC values for CO (1-hour), NO₂ (1-hour), and PM (24-hour).

Key sources of information:

- Rowan Williams Davies Irwin (RWDI) field monitoring work
- Ministry of Environment and Energy, Air Quality Data
- The Report of the Hamilton-Wentworth Air Quality Initiative (1997).

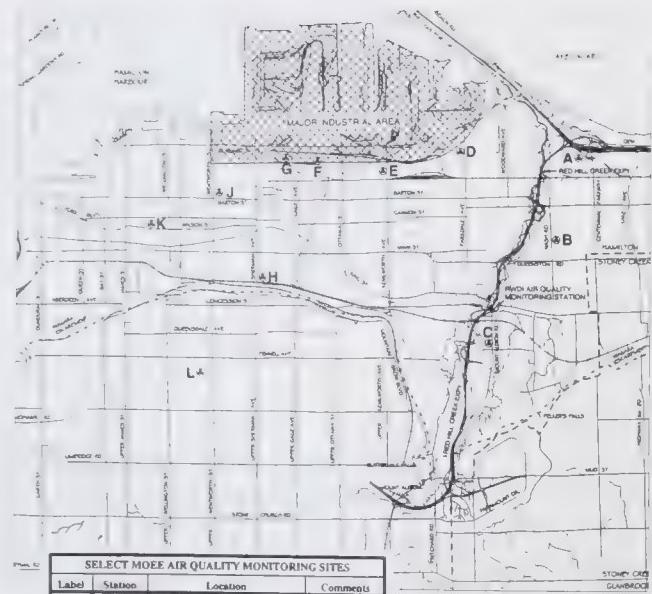


Figure A

SELECT MOEE AIR QUALITY MONITORING SITES		
Label	Station	Location
A	29141	near Q.
B	29105	Nash Rd/Henry Dr
C	29135	Albion Rd/M. Albion Rd
D	29119	Murley/Parkdale
E	29009	Kens worth
F	29113	Central/Depew
G	29011	Burlington/Lester
H	29087	40% Cumberland Ave
J	29023	Barton/Wentworth
K	29000	Elgin/Kathy S
L	29114	Victoria Rd/Lake 18th St

Condition: Noise

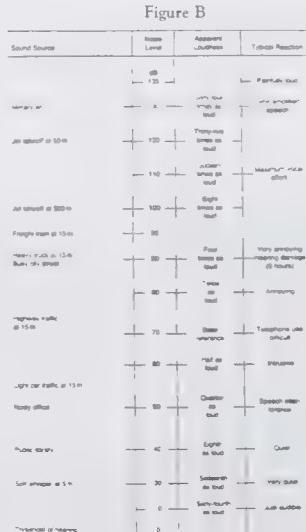
Focus: Change in existing noise levels caused by the Expressway

What we know

- Existing sound levels within the study area vary from relatively quiet areas backing on to the Red Hill Creek Valley, to noisy areas typical of a major urban centre. Figure B relates typical sound levels to common sources of noise and average human perception.
- The human settlement maps indicate a number of noise monitoring locations where sound exposure measurements were conducted. Sound exposure levels for residential areas are measured in L_{eq}^{24} , the energy equivalent sound exposure level averaged over a 24 hour period. Non-residential areas, such as parks, trails, institutional centres and golf courses were monitored as well.
- Current measured L_{eq}^{24} levels range from 47 dBA to 62 dBA, depending on monitoring location.
- Sites with sound exposure levels below 50 dBA are influenced primarily by the sounds of nature while those sites with sound exposure levels above 50 dBA are influenced by urban noise, primarily road traffic. Higher sound exposure levels generally indicate a greater influence of existing road traffic noise.
- Based on general practice, changes in sound exposure levels of 3 dBA or less are considered insignificant, not noticeable to humans; 4-5 dBA is often considered a just noticeable difference; 6 dBA as marginally significant; and 10 dBA or more as significant on an increasing basis.
- Given the extensive amount of develop-

ment in the study area, the sound exposure levels currently experienced along city streets are not expected to change significantly after the expressway is built.

- Typically, in the absence of noise walls or other screening effects, L_{eq}^{24} sound exposure levels generated by the Expressway at the closest residences (approximately 100 m from the Expressway) could range from 60 - 65 dBA. Site specific predictions will be made once the Expressway alignment is set.
- Based on current practice, sound exposure increases of up to 5 dBA above what currently exists (or 55 dBA, whichever is higher) do not require mitigation (barriers). Increases of more than 5 dBA require an investigation for implementing mitigation within the road right-of way. However, mitigation is warranted only if the measures used are capable of producing 5 dBA or more reduction in sound exposure averaged over the first row of adjacent receptors.
- Sound exposure levels generated by the Expressway will be affected by many factors including: distance setback, screening effects (e.g. topography, intervening houses, other types of barriers), traffic volumes and vehicle composition (i.e., percentage of trucks), traffic speed, pavement type, and roadway grade.



Key legislation and policy:

- Environmental noise guidelines exist which address the noise impact of new highway projects. The Ministry of the Environment and Energy (MOEE) and Ministry of Transportation Ontario (MTO) protocol uses a design guideline (Leq 24) of 55 dBA or the ambient sound exposure without the undertaking, whichever is higher, as being desirable. The protocol is general and does not distinguish between urban or suburban settings.
- MTO document Directive QST A-1, "Noise Policy and Acoustic Standards for Provincial Highways" also outlines requirements consistent with the joint MTO/MOEE protocol for new highway projects.

Key sources of information:

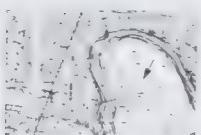
- Rowan, Williams, Davies & Irwin Inc. (RWDI) field work conducted as part of Expressway investigations

(2.3)

Condition: Noise

3.1 Definitions

3.1 Definitions



Contour Lines - a line drawn on a map that show how high the ground surface is.



Culvert - comes in a variety of shapes & sizes; however the principal use is to carry water.



Cut - "the road is in cut" - this means earth has been removed to make space for the road

Over the next six months staff will use a number of terms that might not be familiar to members of the community. The following definitions will hopefully provide some clarification.



Fill - "the road is in fill" - this means earth is added to the existing surface to support the road.



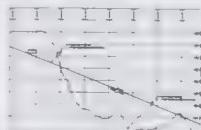
Median - the space between the north bound and south bound travel lanes



Scale - allows the reader to measure distances on a map (e.g., scale 1:2500 means 1 centimetre measured on the map is equal to 2500 centimetres on the ground).



Plan - a map that shows the outline of buildings, roads, etc



Profile - shows the changes in height the roadway makes over a given distance



Interchange Loop - the part of the interchange that you use to change your direction of travel

Interchange Ramp - the part of the interchange you use to get on and off the Roadway



Viaduct / Bridge - a structure used to span the roadway over a given landform.

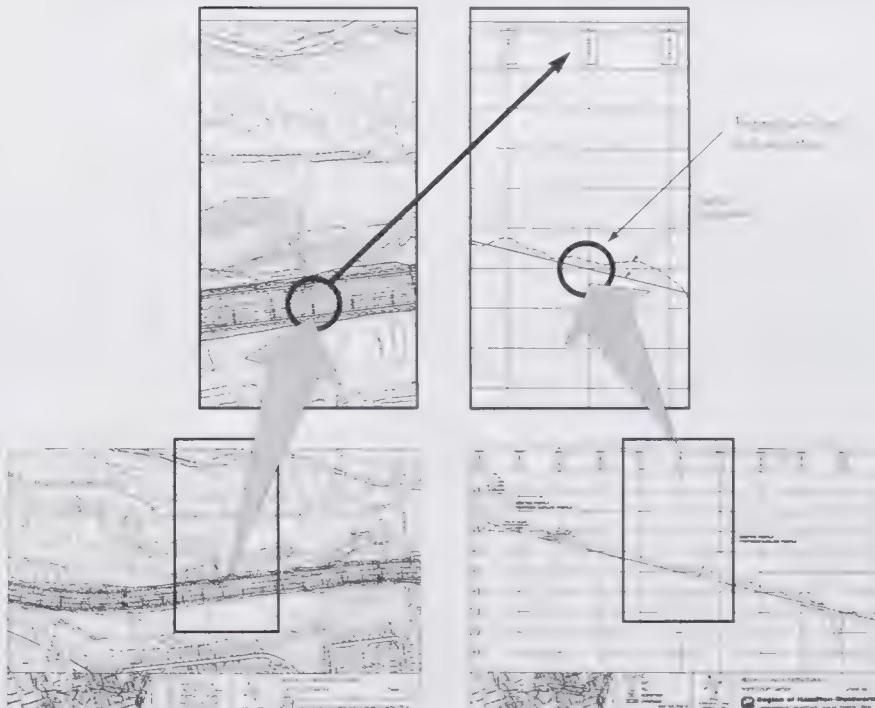
The Current North-South Expressway Design

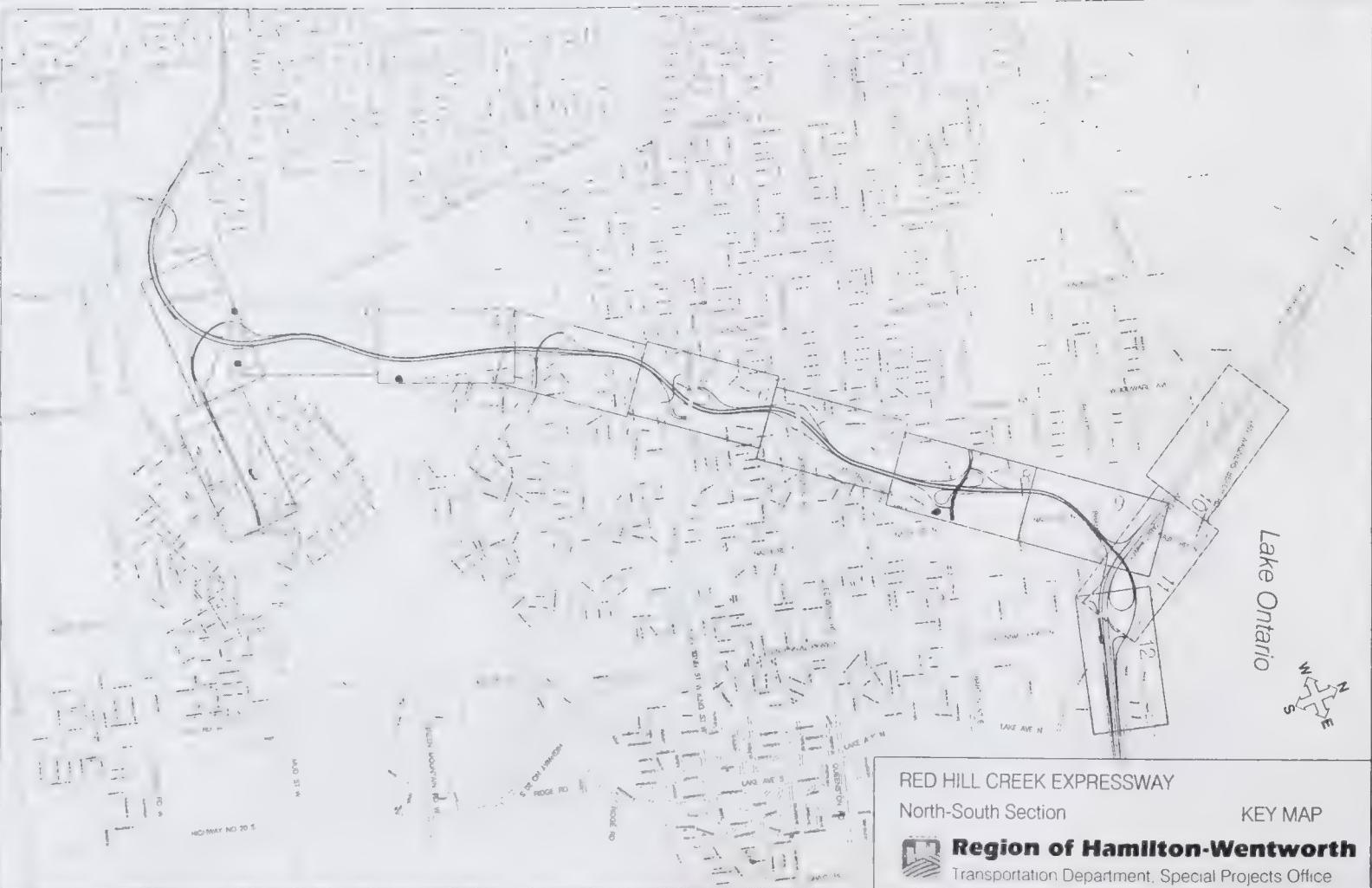
CHAPTER 3

3.2 Current Expressway Plan and Profile

The plan and profile drawings you are about to review identify the Expressway's current horizontal and vertical alignment. To relate the vertical alignment (profile drawing) to the horizontal alignment (the plan drawing) one must compare the same station numbers found on each drawing. For example, 24+000 is found on both drawings 4 and 4A, at which point the road is one metre below the surface.

3.2 Current Expressway Plan and Profile





RED HILL CREEK EXPRESSWAY

North-South Section

KEY MAP



 **Region of Hamilton-Wentworth**
Transportation Department, Special Projects Office



Plan Drawing 2

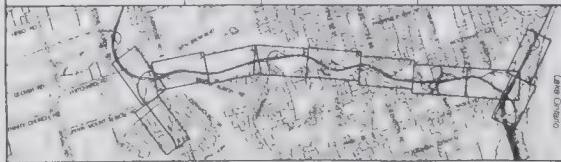
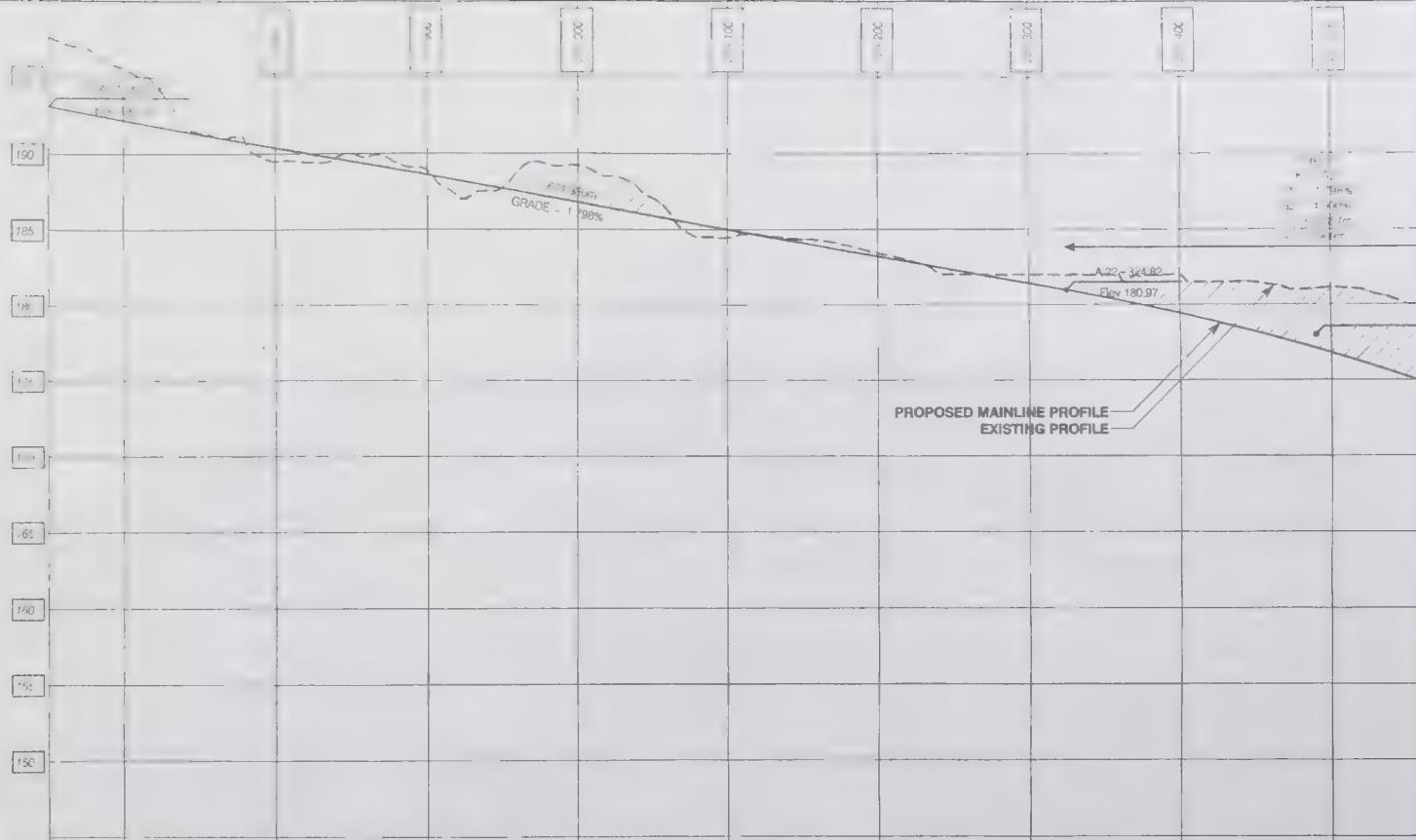
CHAPTER 3



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CHAPTER 3

Plan & Profile Drawing 1/1A



LEGEND

- CUT
- FILL
- ELEVATION
- CHAINAGE

Scaled 1:00 Times Ver
Scaled 1:00 Times Hor

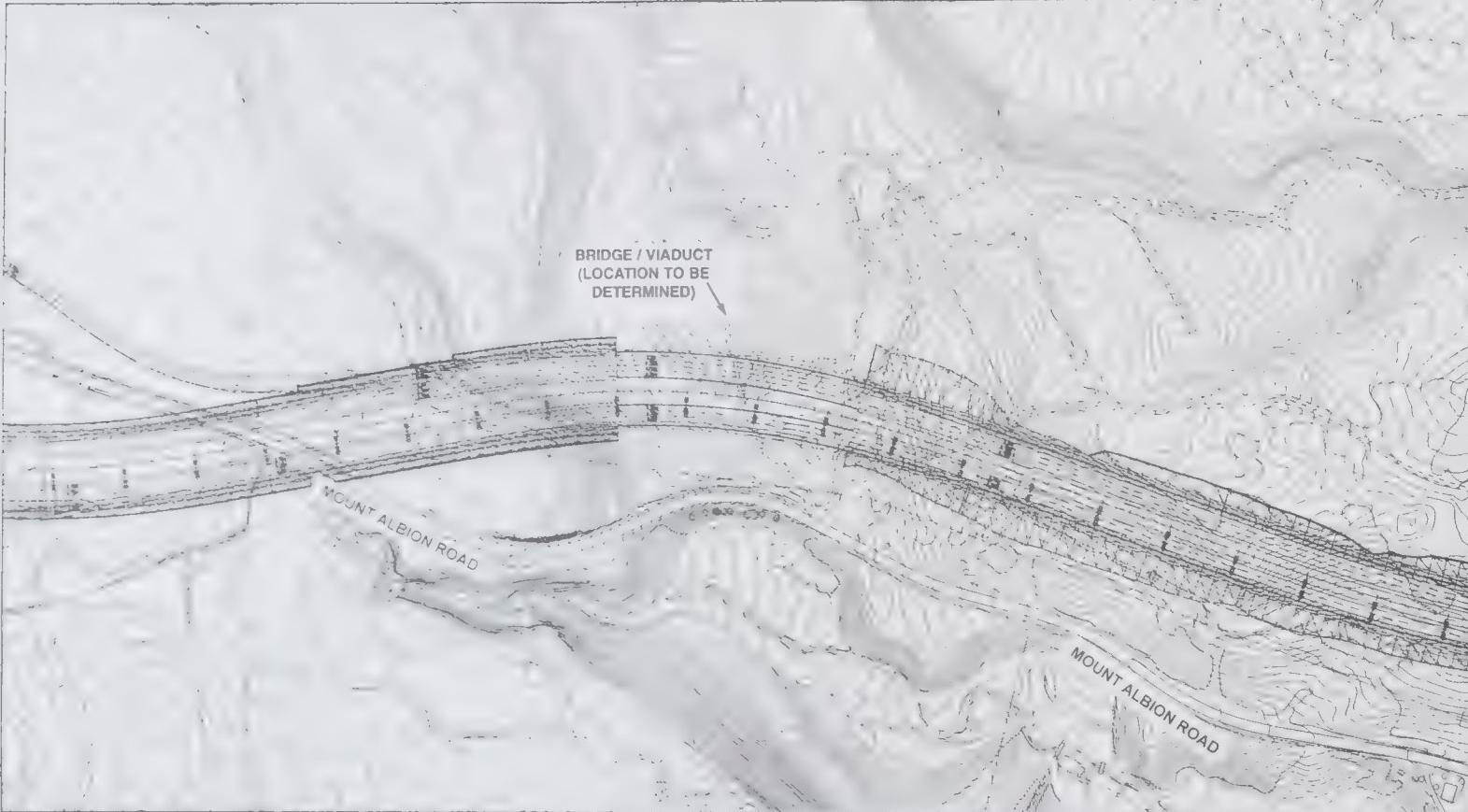


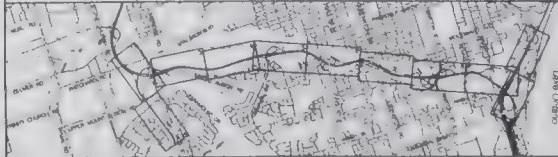
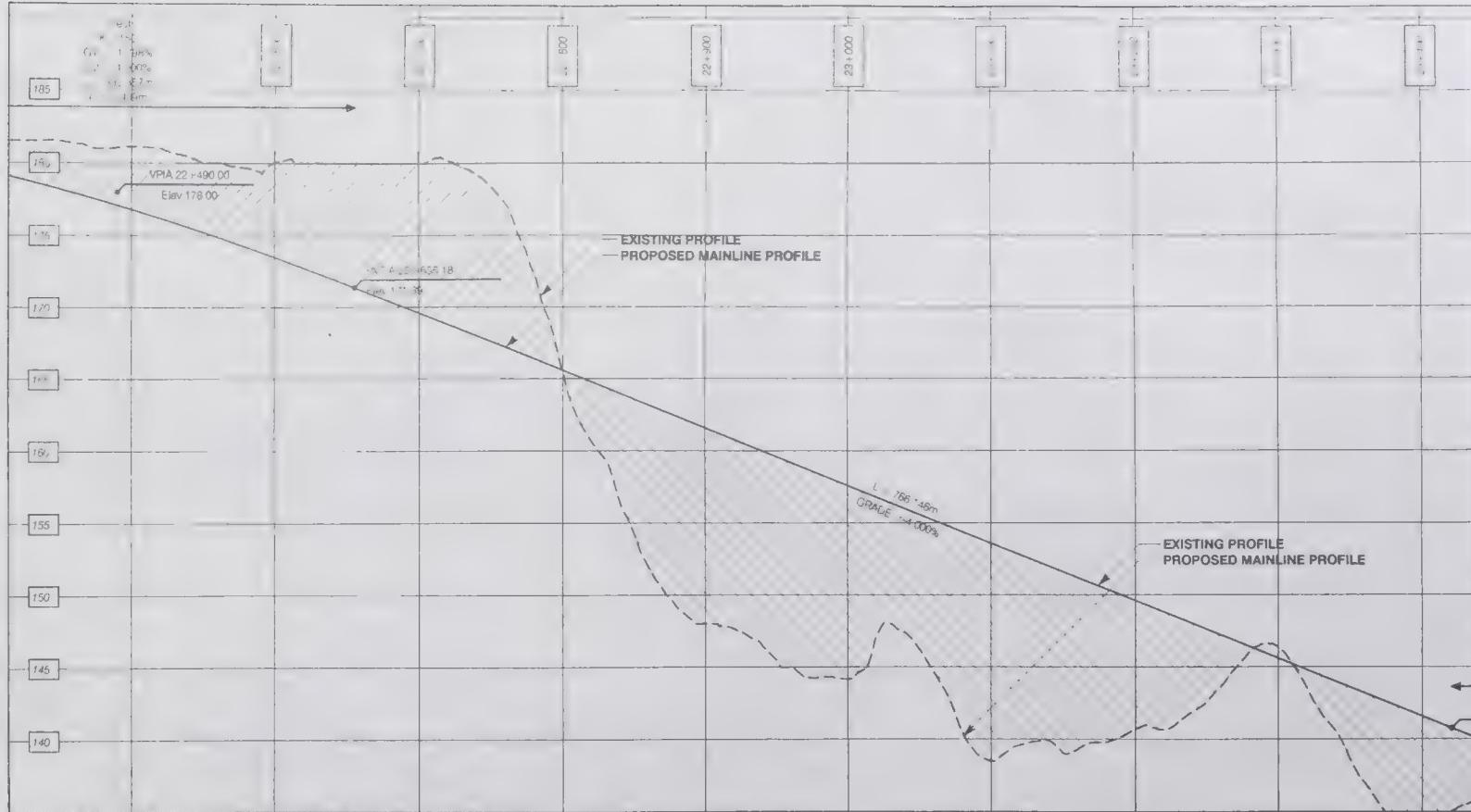
SCALE
HORIZONTAL 1:2500
VERTICAL 1:250

RED HILL CREEK EXPRESSWAY
North-South Section

Sheet 1A

Region of Hamilton-Wentworth
Transportation Department, Special Projects Office





LEGEND

- CUT
- FILL
- ELEVATION
- CHAINAGE

Scaled 10.00 Times Ver
Scaled 1.00 Times Hor



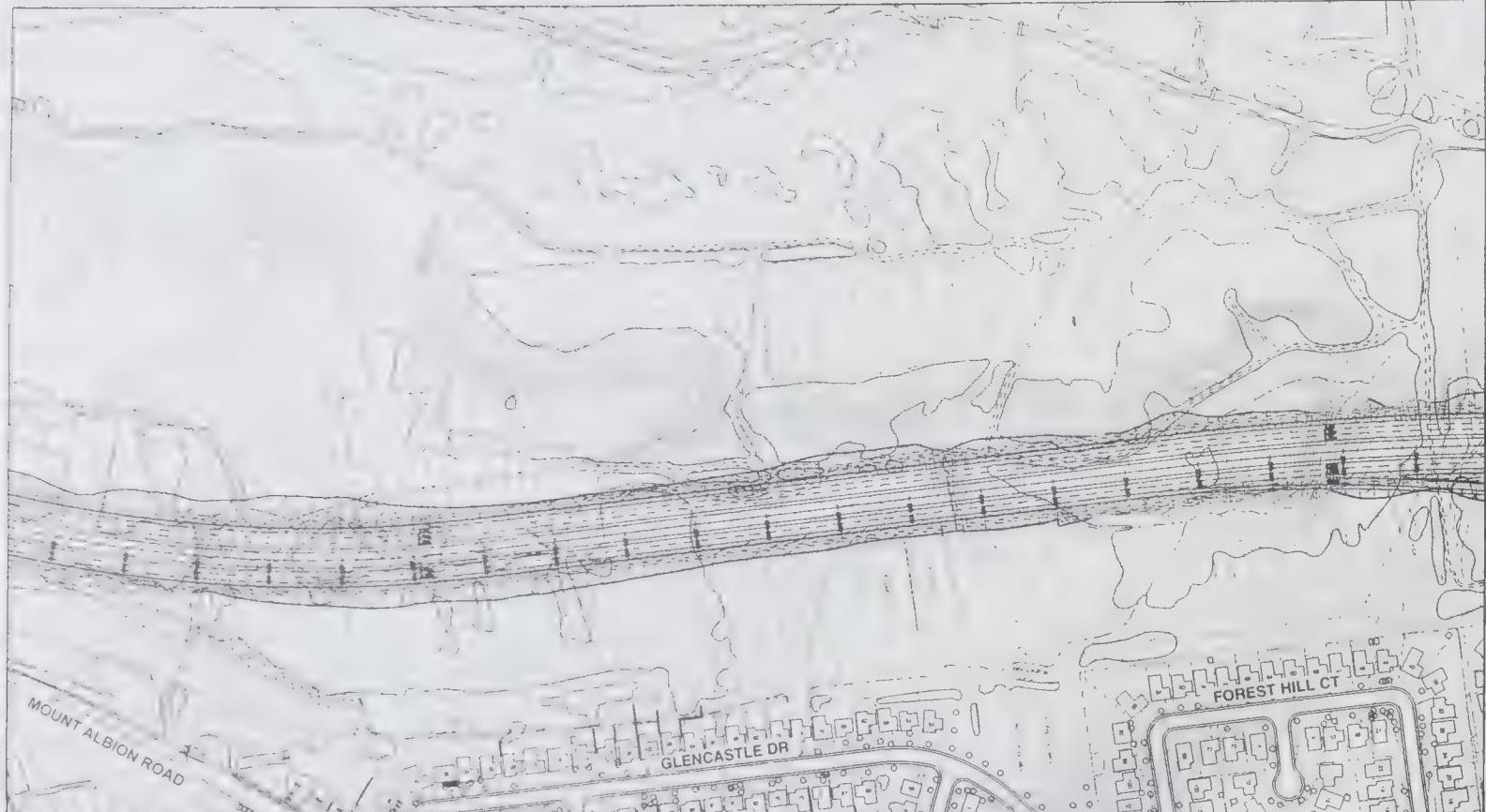
SCALE
HORIZONTAL 1:2500
VERTICAL 1:250

RED HILL CREEK EXPRESSWAY
North-South Section



Region of Hamilton-Wentworth
Transportation Department, Special Projects Office

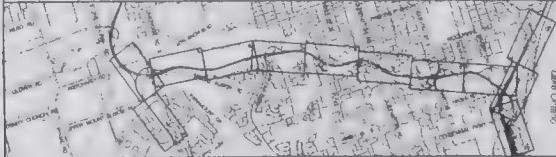
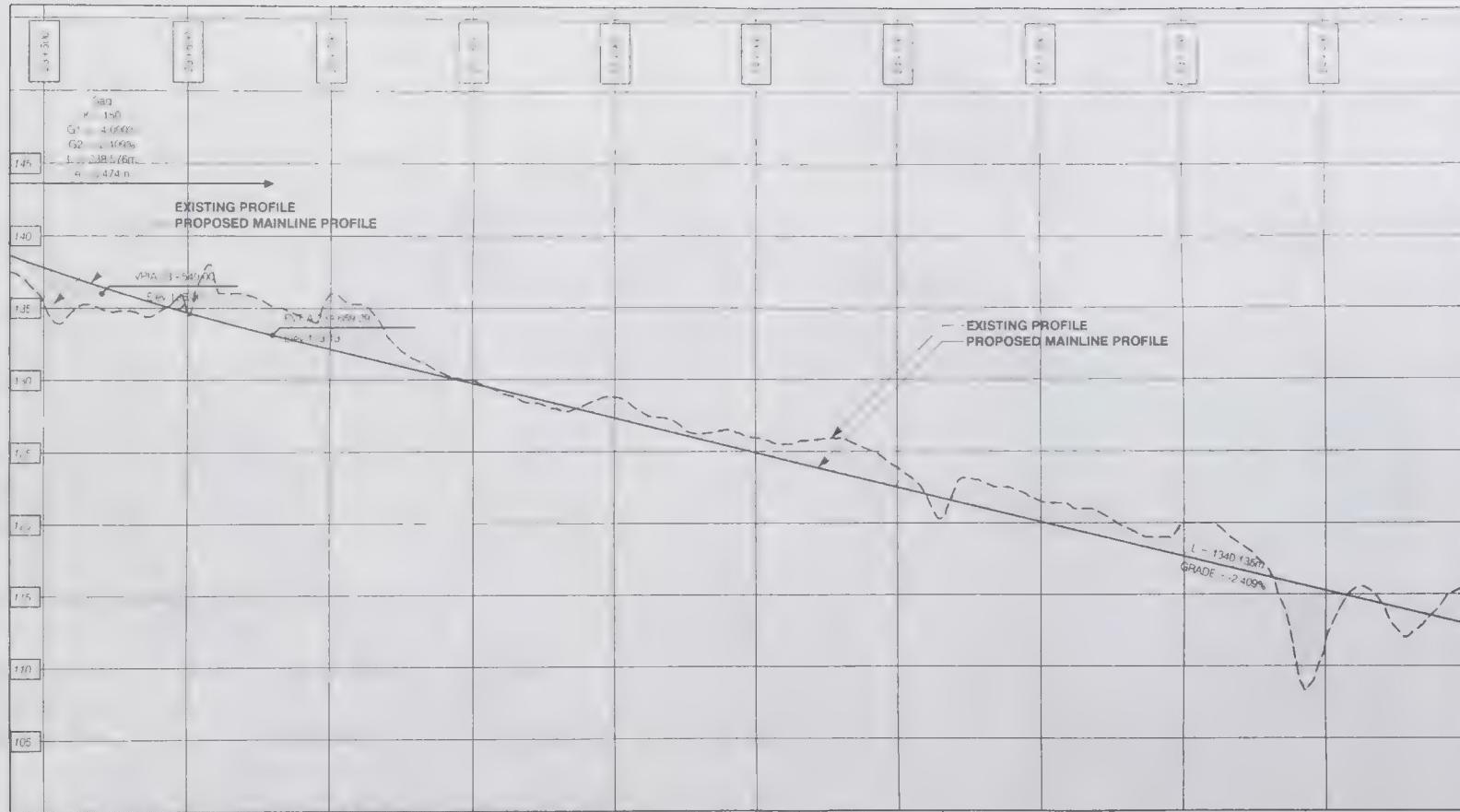
Sheet 3A



50

CHAPTER 3

Plan & Profile Drawing 4/4A



LEGEND

- CUT
- FILL
- ELEVATION
- CHAINAGE

22-7000

Scaled 100 Times Ver
Scaled 100 Times Hor



SCALE
HORIZONTAL 1:2500
VERTICAL 1:250

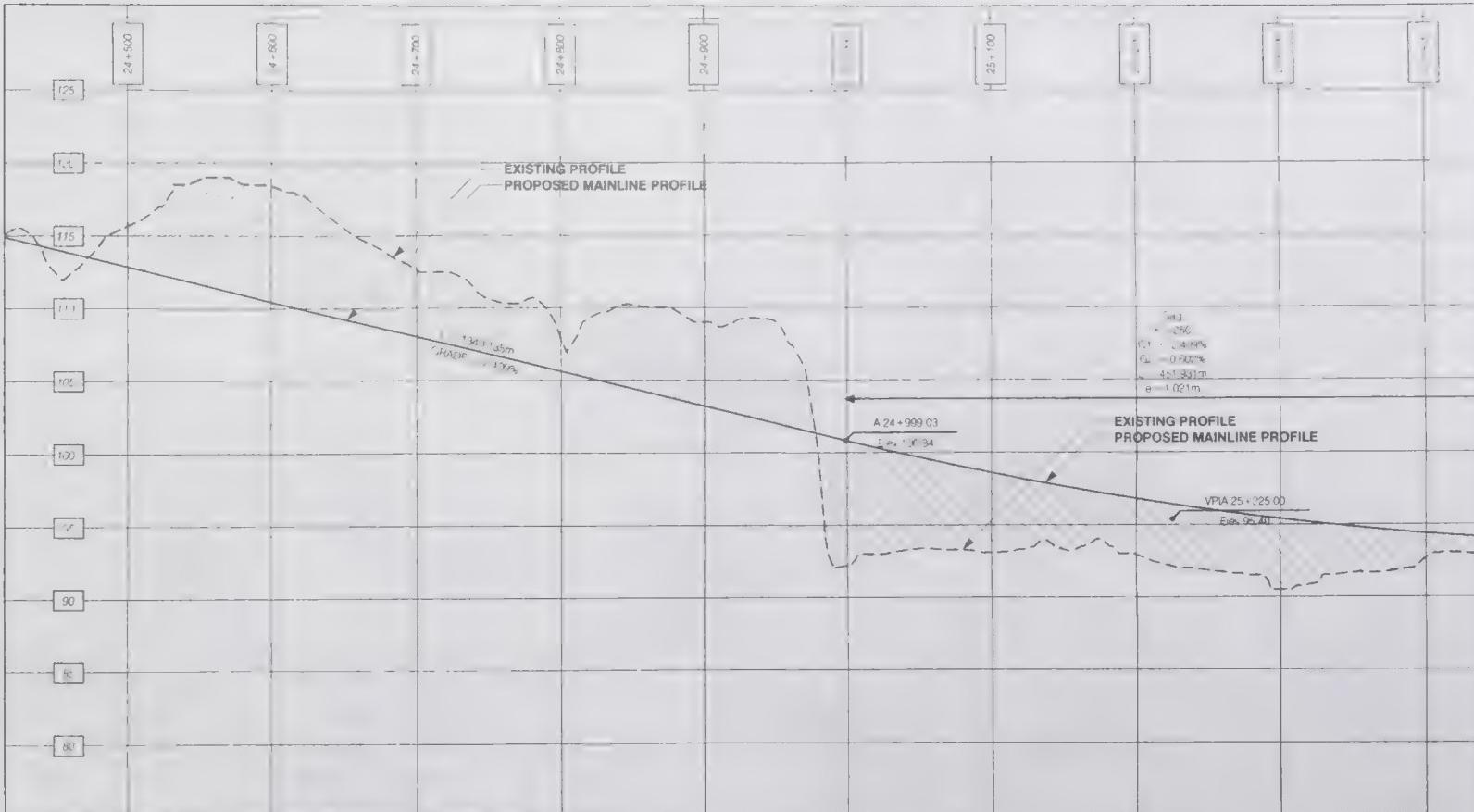
RED HILL CREEK EXPRESSWAY
North-South Section



Region of Hamilton-Wentworth
Transportation Department, Special Projects Office

Sheet 4a





LEGEND

- CUT
- FILL
- ELEVATION
- CHAINAGE

Surveyed 10.00 Times Ver
Scaled 1.00 Times Hor



SCALE
HORIZONTAL 1:2500
VERTICAL 1:250

RED HILL CREEK EXPRESSWAY
North-South Section

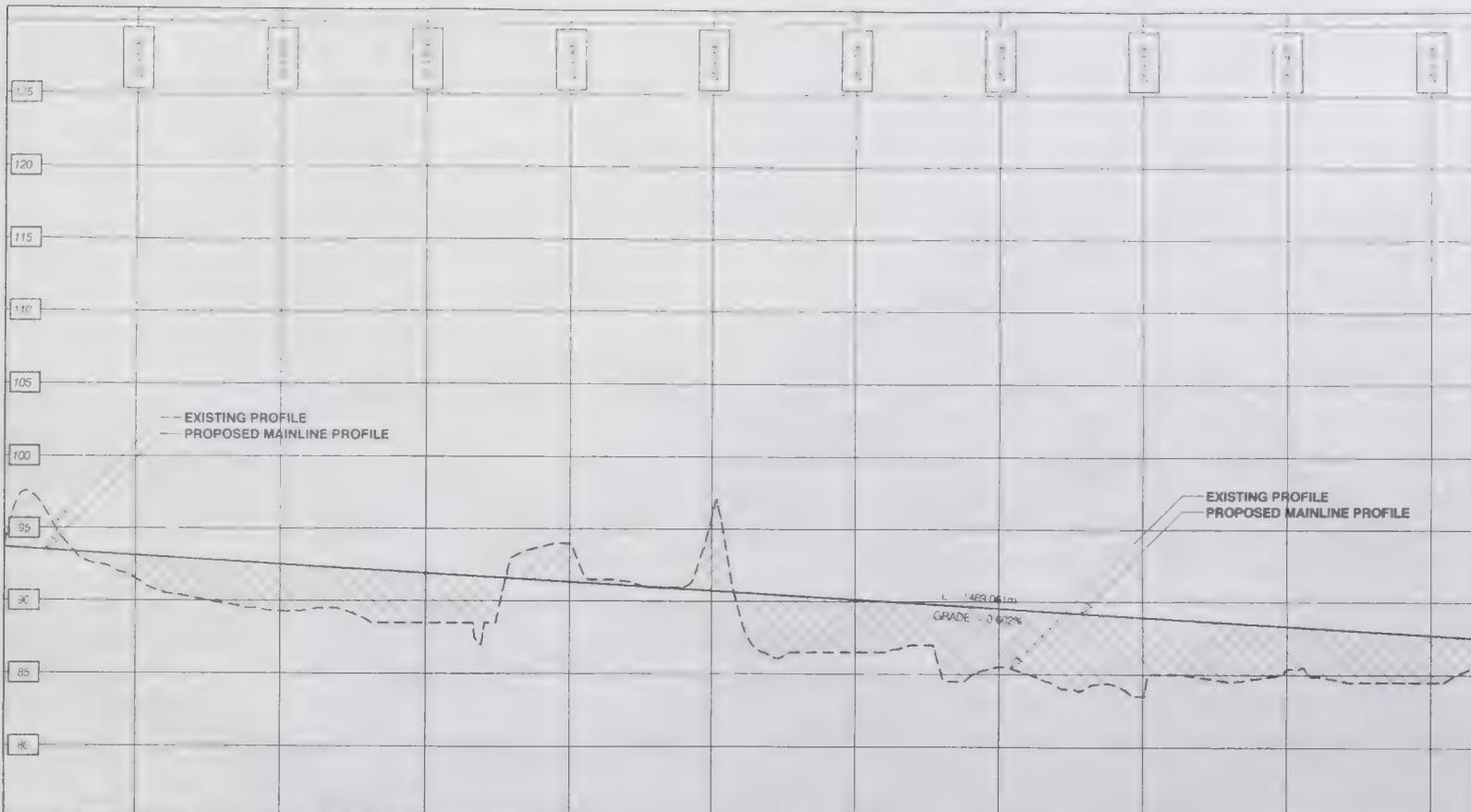
Sheet 5a

Region of Hamilton-Wentworth
Transportation Department, Special Projects Office



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CHAPTER 3**Plan & Profile Drawing 6/6A**



LEGEND

- CUT
- FILL
- ELEVATION
- CHAINAGE

Scaled 10.00 Times Ver.
Scaled 1.00 Times Hor.



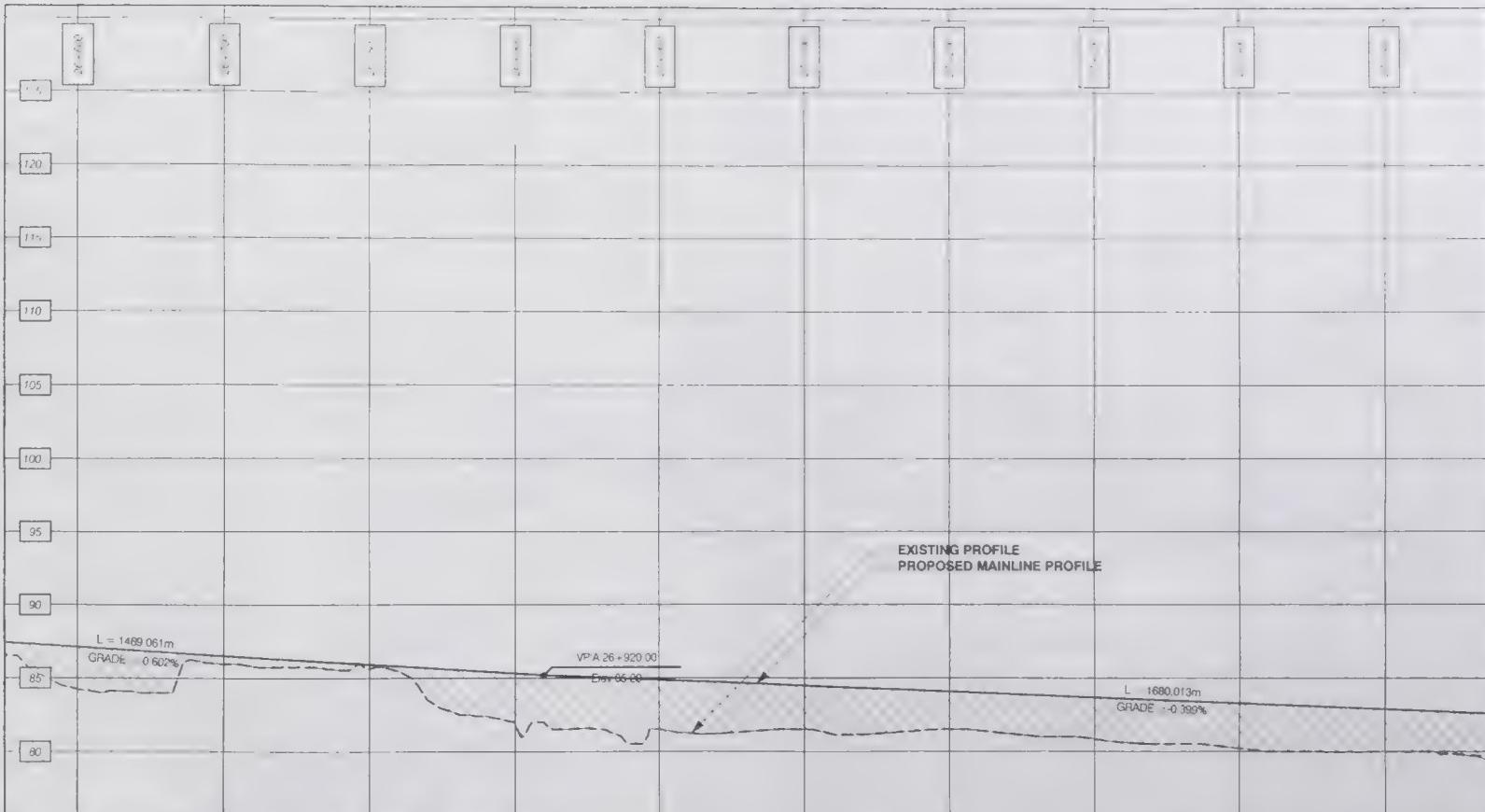
SCALE
HORIZONTAL 1:2500
VERTICAL 1:250

RED HILL CREEK EXPRESSWAY

North-South Section

Sheet 6a





LEGEND

- CUT
- FILL
- ELEVATION
- CHAINAGE

Scaled 1:00 Times Ver
Scaled 1:00 Times Hor



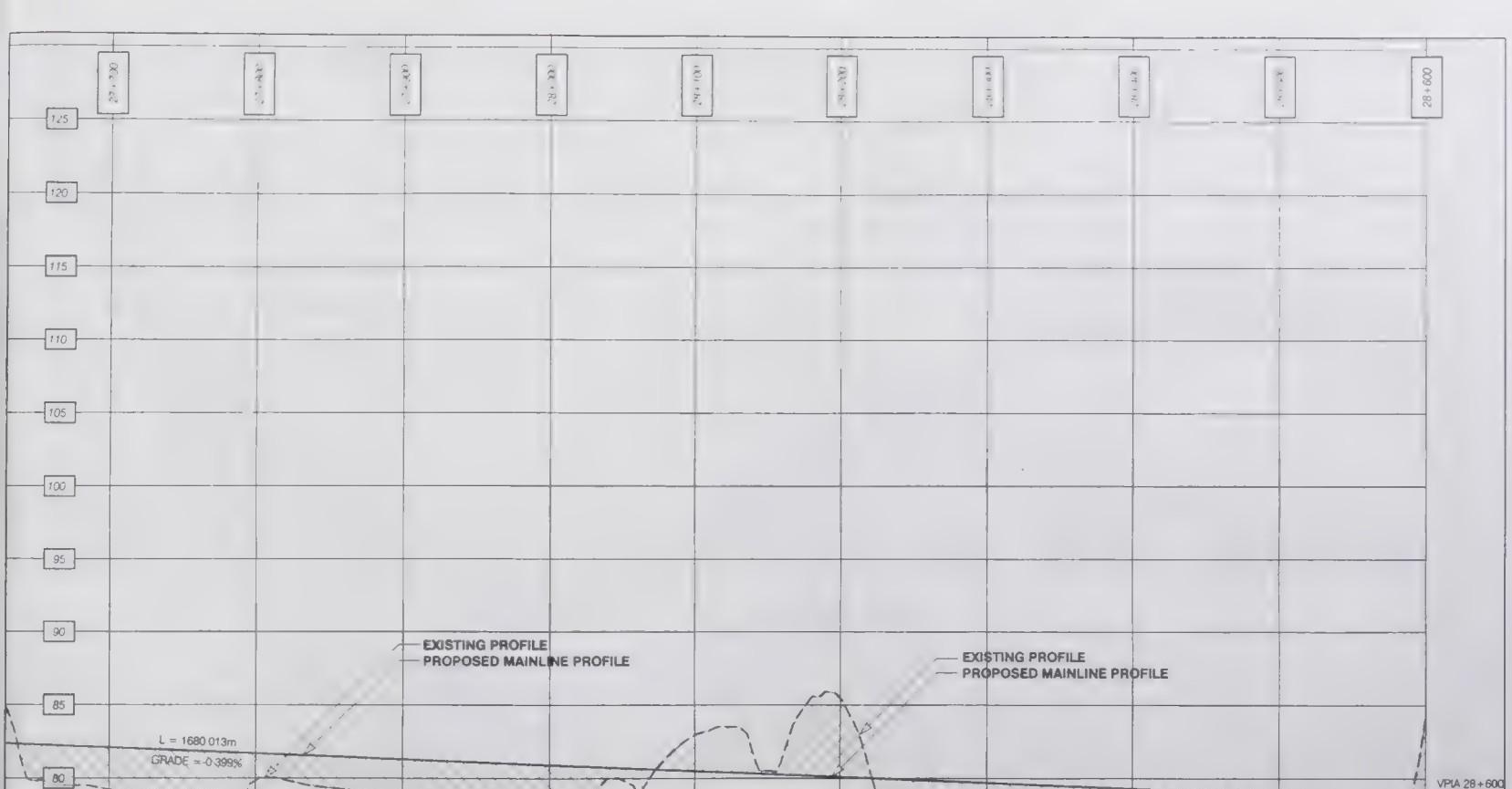
RED HILL CREEK EXPRESSWAY

North-South Section

Sheet 7a

Region of Hamilton-Wentworth
Transportation Department, Special Projects Office





LEGEND

- CUT
- FILL
- ELEVATION
- CHAINAGE

(22-700)

Scaled 10.00 Times Ver
Scaled 1.00 Times Hor

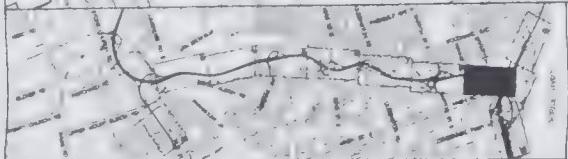
SCALE

HORIZONTAL 1:2500
VERTICAL 1:250

RED HILL CREEK EXPRESSWAY
North-South Section

Sheet 8a

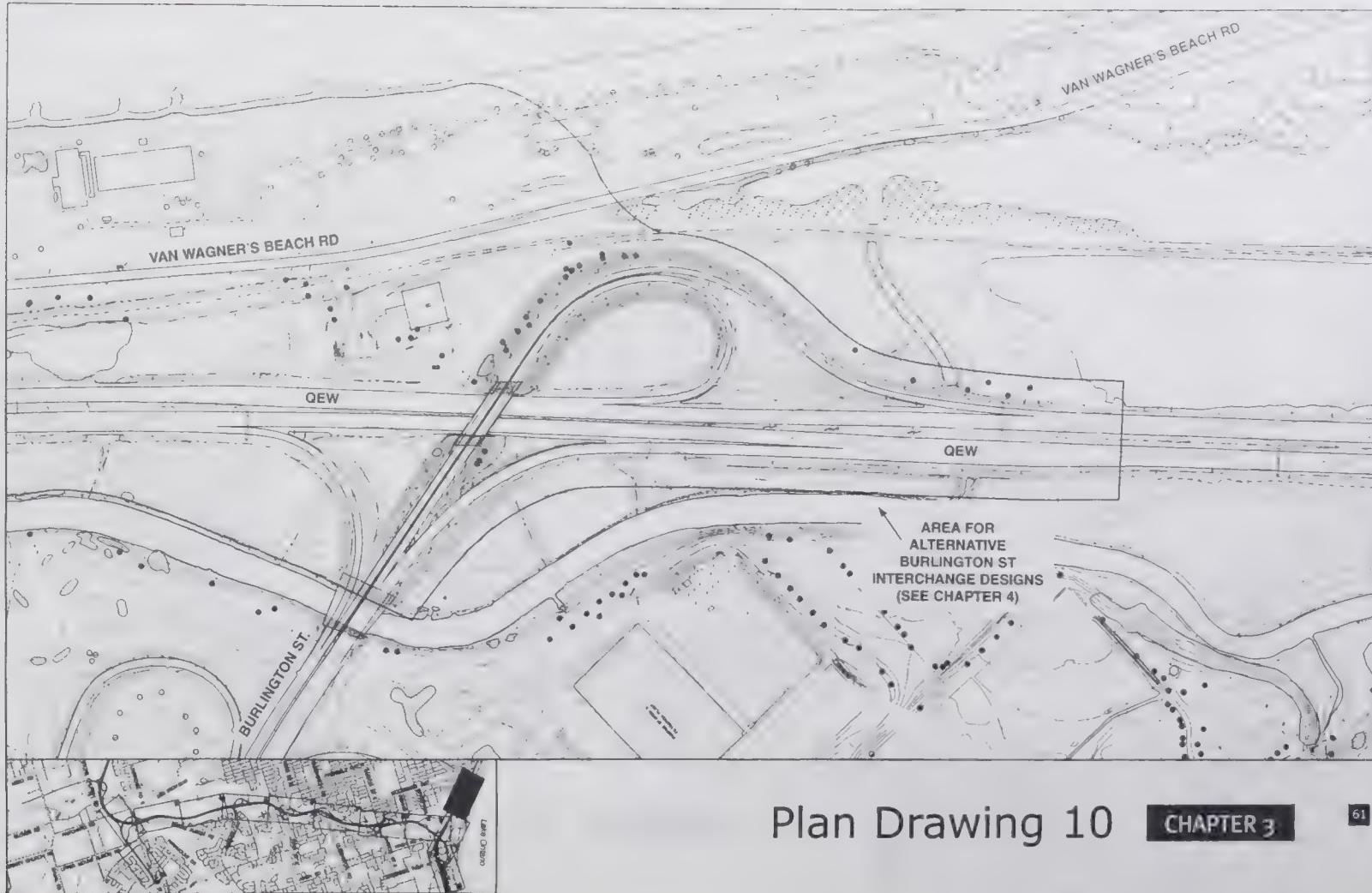
Region of Hamilton-Wentworth
Transportation Department, Special Projects Office



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CHAPTER 3

Plan Drawing 9

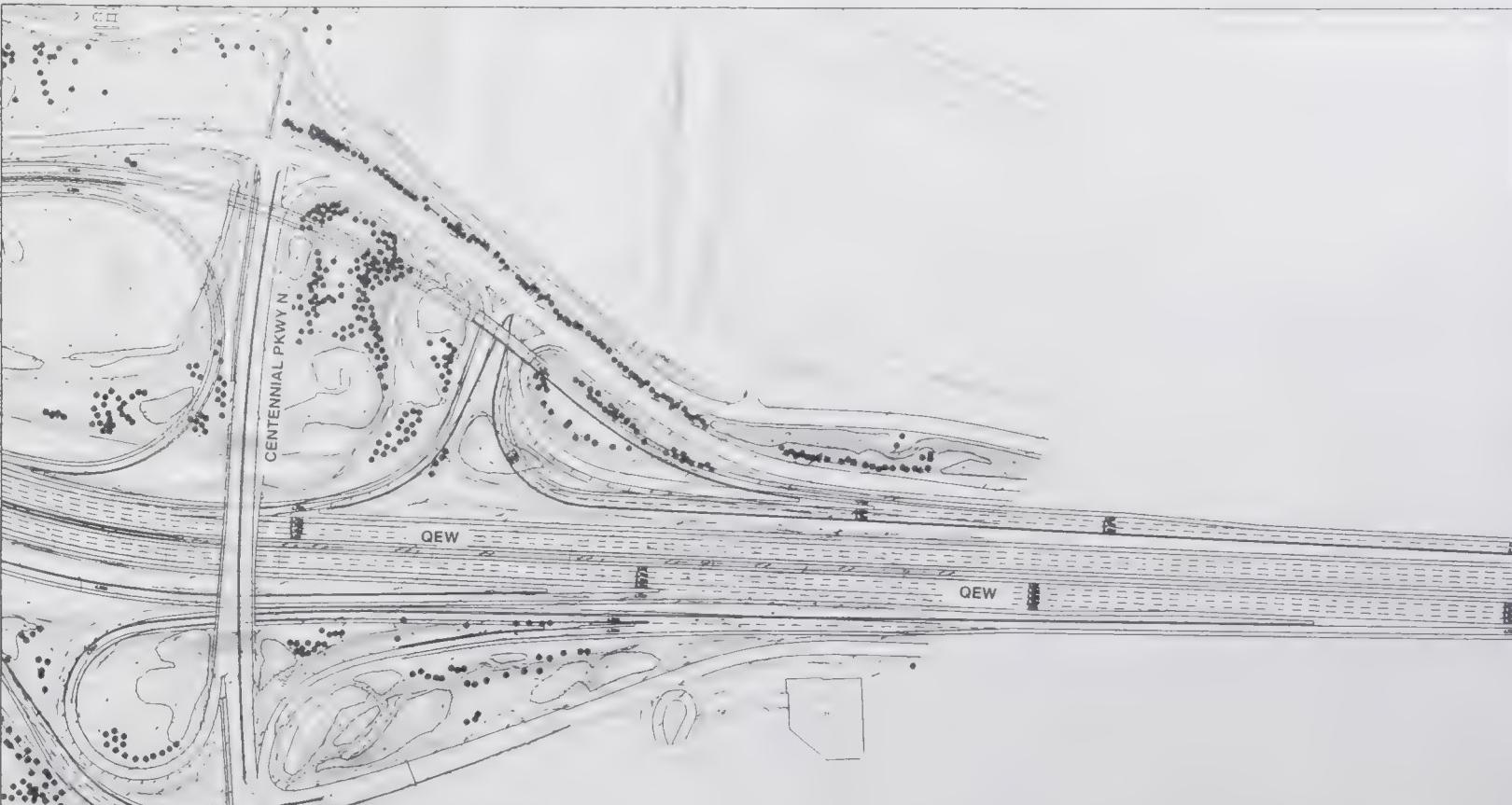




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CHAPTER 3

Plan Drawing 11

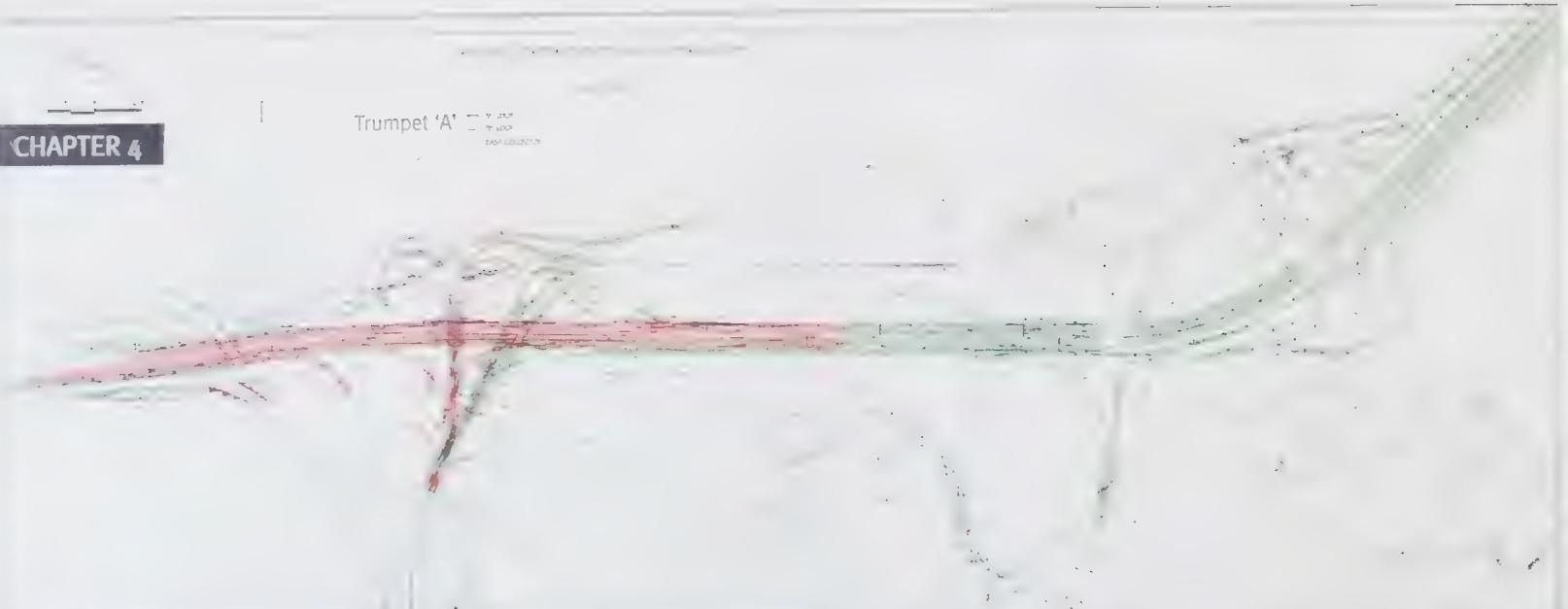


Plan Drawing 12

CHAPTER 3

CHAPTER 4

Trumpet 'A'



Trumpet 'B'



Minor Refinements to the Current Expressway Design

4.1 Expressway Design Commitments Specified in the Exemption Order

Changes are proposed to the Expressway alignment approved in 1985 to reduce environmental impacts while maintaining traffic operations at an acceptable level. Section 3.3 of the Exemption Order authorizes the Region to investigate three basic changes. They include: a new design and location for the Queen Elizabeth Way (QEW) interchange, a new Niagara Escarpment crossing location and structure type, and enhanced community access opportunities (vehicular, cyclist, and pedestrian).

Queen Elizabeth Way (QEW) Interchange

Proposal:

To determine within the area generally bounded by Hamilton Harbour, Canadian National Railways - Grimsby Subdivision, Highway 20, and Burlington Street the appropriate location for a "trumpet" type interchange connection to the QEW.

Objectives:

- To reduce impacts on wetlands and landfills; and,
- To ensure the ongoing safe and effective operation of the QEW in a manner which is compatible with that provided by the completed and/or approved QEW improvements between Highway 403 and 406

Rationale:

The 1985 Joint Hearing Board decision confirmed the need for an Expressway connection to the QEW and included this in the definition of the undertaking. The exact location of the interchange was not specified although a possible alignment was shown in the Environmental Assessment document. Early alignment locations crossed Van Wagner's Ponds, Red Hill Marsh, and two landfill sites located within

the approved corridor. The Ministry of Transportation (MTO) was given responsibility by the Joint Board for determining the final interchange location and design. This prime responsibility for the planning and preliminary design has now been delegated to the Regional Municipality of Hamilton-Wentworth. MTO will carry out the detailed design and construction

The QEW is the key highway corridor between the GTA, Hamilton-Wentworth, Niagara and the United States. Its ongoing safe and effective operation is key to a functional highway/transportation network in the GTA/Hamilton-Wentworth/Niagara areas.

Since the earlier work completed by MTO at this location, the Red Hill Marsh and Van Wagner's Ponds have been designated Provincially Significant Wetlands (Class I). Provincial policy seeks to prevent any damage to these resources.

An Expressway/QEW interchange located closer to Highway 20, will allow the Region to reduce the environmental impacts and maintain acceptable traffic operations. This new interchange location would be situated outside of the approved roadway corridor. On June 20, 1995, Regional Council authorized a development freeze on lands in this area to allow for construction of the proposed interchange.

Comparison:

1. Trumpet 'B' type interchange aligned through the Rennie Street Landfill, Van Wagner's Ponds, and Red Hill Marsh as examined by MTO in 1990 (see Figure C); to

2. Trumpet 'A' type interchange aligned through industrial lands located in the southeast corner of Nash Road and Brampton Street (see Figure D)

Both of these interchange alignments could include modifications to the QEW corridor within the East/West QEW study limits.

NOTE: since the time of the Exemption Order the Ministry of Transportation has identified three options for interchange modifications at Burlington Street which are required in the near future to maintain traffic operations at an acceptable level.

Expressway Design Commitments Specified in the Exemption Order

Queen Elizabeth Way (QEW) Interchange

Niagara Escarpment Crossing

Proposal:

The original proposal was to assess, within the limits of the approved corridor, the environmental benefits of crossing the Niagara Escarpment with a single alignment on the west side of the hydro-towers versus twin alignments on the east and west side of the towers, as originally approved. In addition, the original concept of building the Expressway entirely on earth fill would be compared to a combination earth fill/viaduct (bridge) approach.

(4.1) Niagara Escarpment Crossing

Community Access (Pedestrian/ Cyclist Access)

Objectives:

- To reduce cuts on the Escarpment brow and earth fill requirements;
- To reduce the Expressway grade;
- To reduce impacts and costs associated with utilities;
- To reduce the aesthetic impact of the Escarpment crossing, and
- To accommodate pedestrian/cyclist and wildlife movements underneath the roadway

Rationale:

The approved Expressway alignment crosses the Niagara Escarpment in the following manner

- ascending lanes and descending lanes cross the Escarpment at 6% and 7% grades, respectively, on fill material;
- northbound traffic travels on a two-lane alignment located just east of the Ontario Hydro corridor (adjacent to Mount Albion Road), and
- southbound traffic travels on a three-lane (including truck climbing lane) alignment just west of the Ontario Hydro corridor

The 1982 Region's Environmental Assessment Report (EA) indicated that this portion of the Expressway would create major impacts to the aesthetic character of the Escarpment. In an effort to reduce the predicted impact, the Region, in 1994, assessed the feasibility of crossing the Niagara Escarpment on a viaduct (bridge) at an approximate 4% grade with all travel lanes aligned one side of the Ontario Hydro

corridor. The preliminary findings indicated that the roadway could be accommodated on the west side of the hydro corridor on a viaduct.

With regards to which side of the hydro corridor would have the least overall impact, the Region's preliminary investigations appeared to favour the west side as opposed to the east. The problems identified with an easterly alignment were as follows

- higher costs to access hydro corridor (i.e., would have to construct service road for Ontario Hydro and Trans Northern Pipeline);
- significant impact to local recreational land use (i.e., golf course would have to be reconfigured);
- must relocate Trans Northern Pipeline;
- must relocate trunk sanitary sewer; and
- does not provide pedestrian/cyclist access from the lower area to the upper.

Comparison:

1. The approved plan which splits the travel lanes on both sides of the Hydro towers and requires earth fill to bridge the road as it crosses the Escarpment; to
2. Build all lanes on the west side of the Hydro towers on a viaduct within the approved corridor.

NOTE: As a condition of approval for the Exemption Order, the Ontario Minister of Environment and Energy has stated "construction of the interchange with the Queen Elizabeth Way is only authorized if The Regional Municipality of Hamilton-

Wentworth is implementing the Niagara Escarpment crossing as set out in the exemption order submissions as to ensure that the final alignment is an improvement over the 1985 approved Niagara Escarpment Crossing". Therefore, the comparison of a split versus single crossing of the Niagara Escarpment is no longer required given the position taken by the Ministry of the Environment and Energy. The location and length of the viaduct need however to be assessed in terms of visual impact, cost and roadway/bridge design.

Rationale:

Access to trails currently being developed by the Red Hill Valley Restoration Project should be enhanced. New opportunities may also be created as a result of proposed changes to the Escarpment crossing.

The need, number and location of all pedestrian and cyclist accesses should be assessed in light of other proposed changes.

Locations:

1. EA approved location for pedestrian crossings south of Melvin Avenue;
2. Locations proposed in early stages of design, specifically, near the Greenhill interchange and at the top of the Niagara Escarpment/Bruce Trail; and
3. Other feasible locations, such as crossing the QEW may be brought forward as part of the Red Hill Valley Restoration Project - Recreational Master Plan and through stakeholder consultation.

NOTE: Section 3.3 concludes with the statement that "any other refinements to the Expressway's horizontal or vertical alignment that arise during the assessment process which serve to mitigate environmental impacts, will be considered approved under the existing Environmental Assessment". This statement allows the Region to make minor refinements to the approved alignment (see Chapter 3) that are within the Expressway study area as defined in the Exemption Order.

Community Access (Pedestrian/Cyclist Access)

Proposal:

To re-examine the opportunities for pedestrian access and, where appropriate, cyclist access to the Red Hill Valley Trails and City recreational sites

Objectives:

To ensure appropriate pedestrian/cyclist access to the Valley and its trail systems; and to ensure Bruce Trail access is maintained

corridor. The preliminary findings indicated that the roadway could be accommodated on the west side of the hydro corridor on a viaduct.

With regards to which side of the hydro corridor would have the least overall impact, the Region's preliminary investigations appeared to favour the west side as opposed to the east. The problems identified with an easterly alignment were as follows

- higher costs to access hydro corridor (i.e., would have to construct service road for Ontario Hydro and Trans Northern Pipeline);
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NOTE: As a condition of approval for the Exemption Order, the Ontario Minister of Environment and Energy has stated "construction of the interchange with the Queen Elizabeth Way is only authorized if The Regional Municipality of Hamilton-

4.2 Minor Expressway Refinement Approach

The information presented so far should provide the reviewer a general understanding of existing watershed features, a more detail understanding of existing Red Hill Valley/QEW features and the Expressway's current alignment. Before we begin discussing the features that will be directly/indirectly impacted by the Expressway, and measures to offset those impacts (i.e., mitigation/compensation), it's important to first consider ways to avoid or minimize impacts. In other words, we must determine whether or not changes to the current Expressway design could save or maybe even enhance existing features.

To do this the Region will:

- examine issues and options put forward by the Watershed Plan (see section 4.3), and
- take a focused look at natural/human settlement features in the valley and along QEW that could be protected/enhanced by shifting the horizontal/vertical alignment of the current Expressway design (see Chapter 3).

4.3 Summary of Watershed Issues and Options, and Expressway Related Actions

Shortly after convening the first meeting of the Watershed Stakeholder Group (May, 1997), participants organized themselves into a number of working groups to focus on specific areas of interest. Each group invested time identifying issues and options which will eventually lead to a set of future actions which stakeholders including the Region of Hamilton-Wentworth could implement through its projects and/or policy documents. The working groups report to the core stakeholder group.

Participation on a working group allowed government agencies, institutions, community groups and individuals to come together to share information and chart a new course for future activities in the watershed. Working group areas of interest included:

- water quality and quantity;
- economic development and land use;
- community action, education and awareness;
- natural habitat restoration and protection;
- recreation, trails open space and cultural heritage; and,
- social development and health.

Issues and options related to water quality and quantity; natural habitat restoration and protection; recreation, trails open space and cultural heritage; and, social development and health are discussed below.

4.2 Minor Expressway Refinement Approach

4.3 Summary of Watershed Issues and Options, and Expressway Related Actions

Issues & Options: Water Quality & Quantity

(4.3)

Issues & Options: Water Quality & Quantity

A group of participants met to identify areas of concern in the watershed that relate to water issues. While they identified a road list of interests, the group concluded that there are two main categories of water issues at the root of a number of problems. These two issues are surface water quantity and quality. The problems are related to stormwater runoff to a large extent but also to discharges of contaminants from a number of potential sources.

The main water quality issues are degraded fish habitat and the human health hazards associated with making contact with stream water having high bacteria levels. Water quantity issues include the high volumes and velocities and high frequency of storm events.

Streams and their floodplains, in natural, unaltered watersheds, typically overtop their banks once or twice per year in response to significant storm events. This process enriches floodplain vegetation with organic sediment and moisture, as well as effectively dissipating adverse erosion-causing energy.

When the flows in a watershed are altered by uncontrolled urbanization, the frequency and magnitude of flooding events increases to several times per year instead of once or twice. This can have a negative effect on aquatic and terrestrial resources. In addition, severe flooding can impact on roads, bridges and culverts.

The following outlines the key issues and the options to address the issues that are of immediate importance i.e. those that should be acted upon now in order to inform various projects and activities in the watershed.

Issues such as water quality are very complex in that the causes are not always well established and therefore the options are not clear. In these cases, additional research may be required before substantive money is directed to implementing a solution. In other cases, available options may be clear and there may be opportunities for immediate implementation. Issues are divided into those that should be implemented in the near future and those that would require a longer time frame to address. The latter will be maintained in the Watershed Plan as the basis for developing future actions.

Issues That Should Be Addressed Immediately

Issue: Stormwater Runoff (volume, frequency, velocity), Erosion and Sedimentation

As a result of ongoing urbanization, storm events are more frequent, velocities and volumes of water are high. Although all creeks erode naturally, most of the creeks are eroding at an abnormally high rate. This is resulting in impacts on infrastructure (culverts, roads), terrestrial and aquatic habitat, slope stability in the Valley, loss of property, high maintenance costs and sedimentation of Windermere Basin. Other sources of sediment include urban and agricultural runoff upstream and the Woodward Sewage Treatment Plant downstream.

Targets (Long Term Goals):

- Natural creeks that are stable (reduced erosion and flooding).
 - No reduced base flows in the creeks
 - Maintenance or enhancement of current infiltration (for new developments).
- Options with examples of actions that could be taken:
1. Reduce storm runoff at source for areas that are already built and new development (at house/building lots, parking lots, etc.):
 - develop a strategy for increasing infiltration in all developed areas in the watershed. Start with a pilot project (e.g. disconnection of roof leaders, rain barrel program, school yard naturalization with wetlands) to be implemented by municipal governments in partnership with community groups, schools, private business, and others.
 - develop alternative development standards in new development to promote infiltration and based on priority subwatersheds
 - develop a strategy to increase forest/tree cover in the watershed
 - increase infiltration of impervious surfaces (new and retrofit as opportunities arise) through various techniques (e.g. pervious asphalt, turf stone) where cost effective and feasible.
 2. Control storm runoff:
 - construct subwatershed storage facilities where appropriate (wetlands/ponds) and associated with various projects underway e.g. Expressway, landfill site remediation, other developments in watershed as they occur
 - 3. Mitigate the impact of the flows in the areas where the creeks are unstable:
 - apply natural channel stream design to lower section of Red Hill Creek to accommodate increased flows and promote stability
 - modify concrete and gabion channels to reduce velocity by using naturalized approaches (including bio-engineering) as opportunities arise through adjacent projects
 - 4. Educate the public about stormwater issues.
 - promotion through various means including schools at all levels, community environmental programs, etc.

Issue: Improving Bacterial Levels in the Creeks

The high levels of bacteria during both high and low flow conditions, pose human health risks to those who come into contact with the water. Children, in particular, swim or wade in the creek and it is difficult to deter them from doing this. While the sources of bacteria are clearly related to storm sewer outfalls during and immediately after storms, the source of bacteria at other times is unexplained. Possible sources include septic systems in the headwaters, illegal sanitary hook-ups to the storm sewers or ongoing leakages of sanitary pipes.

(4.3)

Issues & Options: Water Quality & Quantity

Targets (Long Term Goals):

- a creek system that is safe for physical contact including swimming
- a faecal coliform count of no more than 100 parts per million (meets Provincial Water Quality Guidelines for swimming)

Options for dealing with stormwater sources of bacteria:

1. construct CSO tanks in Valley
2. determine if there are dysfunctional septic systems
3. construct regional water quality storage facilities (wetlands)
4. construct water quality facilities in new developments (wetlands, infiltration)
5. retrofit existing facilities if necessary (Greenhill)
6. improve Woodward Sewage Treatment Plant efficiency & capacity

Options for dealing with other sources of bacteria:

1. monitoring and research to determine sources of bacteria during low flow in the creeks.
2. develop an implementation strategy to address identified sources of contamination.

Issue: Enhancing Water Quality for Fisheries and Wildlife

Fish are probably being affected by the adverse water quality conditions (nutrient enrichment and algal growth), however, the

causes and effects are not clearly understood at this time. The problem occurs throughout the system. Unexplainable losses of fish species have occurred on the Mountain. While typical species for urban streams have been found below the Escarpment, the lower sections of the stream are degraded partly from the Sewage Treatment Plant backwater and partly from other chronic, nonpoint sources or possibly through acute conditions (spills) that are unreported.

Targets (Long Term Goals)

- a creek with water quality that sustains fish communities as per the Provincial Water Quality Guidelines and with particular reference to ammonia and toxic metals.

Options:

1. Any options that are carried out to deal with bacteria will facilitate improvements to fish and wildlife habitat
2. Additional research to further determine specific causes of contaminants and effects on fish & wildlife with specific reference to identifying the cause of fish disappearance in the Mountain streams and fish kills in the lower creek.
 - develop a research and monitoring program with the following components: habitat condition, water quality parameters (ammonia, metals, PAH, temperature, vegetation), biological monitoring, water quality monitoring
3. Maintain a buffer or vegetation adjacent to the creek:
 - develop a municipal by-law

4. Re-stock creeks on the Mountain with fish species previously found there:
 - demonstration project with monitoring
5. Encourage private stewardship initiatives re: use of pesticides, use of storm sewers etc.

by-laws

3. Develop hydrogeological guidelines for carrying out studies in support of development applications to provide a consistent approach to these studies.
 - apply existing guidelines

Issues That Should Be Included in the Watershed Plan for Future Action:

- impact of degraded water quality on Windermere Basin
- impact of air quality on stream water quality
- improvement to the quality of Woodward Sewage Treatment Plant effluent
- long range plans for ponding on golf course and possible partnerships
- base flow enhancements

Target (Long Term Goals):

1. Land use practices are managed such that there are minimal risks of groundwater contamination

Options:

1. Prioritize existing and potential groundwater contamination by using the contaminant sources inventory and implement appropriate investigation and/or mitigation
 - review existing groundwater contamination studies and identify the need for additional site specific hydrogeological studies
2. Apply Best Management Practices Guidelines for stormwater infiltration and spill management to new and existing development
 - develop guidelines and associated

Issues & Options: Habitat Protection & Restoration

(4.3) Issues & Options: Habitat Protection & Restoration

The Habitat Protection and Restoration working group met to consider key issues related to terrestrial and aquatic habitat. Opportunities and actions for addressing the issues were also discussed.

The Working Group felt that top priority should be given to actions which and conserve existing habitat. Remediation of degraded habitat and restoration of lost habitat are worthy objectives but should not be substituted for protecting what remains.

In the interest of taking some opportunities that may be available in conjunction with Regional and other projects, the following discusses those which the Working Group believes should be addressed. Additional issues which should be pursued at a later date are listed at the end of the summary.

Issues That Should Be Addressed Immediately

Issue: Education is Needed

Actions by the public, private interests and government agencies often don't reflect an appreciation of concepts, issues and opportunities associated with natural habitat

Targets (Long Term Goals):

- the public supports and contributes to Watershed initiatives
- private sector development incorporates ecosystem principles as development standards
- government projects incorporate ecosystem principles as standards
- community achieves a "gold star" for its efforts

Options:

- monitor projects associated with ESAs and report on rate of habitat recovery, possibly in association with Sustainable Community Day
- in conjunction with Stewardship program reward achievements in habitat enhancement and restoration by individuals and communities
- seek funding to assist the Watershed Interpretive Centre in promoting awareness in schools
- establish a Watershed Council made up of community members (with a co-ordinator)
- promote Yellow Fish drain marking projects by students

- erect water quality warning signs and produce brochures about water quality
- erect signs marking the Watershed boundary
- link awareness programs to National events i.e. Environment or Wildlife Week, Earth Day

tat and species
• map areas where research and inventory is needed

Issue: Existing Habitat is Degraded, Threatened or Has Been Eliminated

Both terrestrial and aquatic habitat in the Watershed are threatened due to degradation or have been eliminated altogether. This comes as a result of agricultural activities in the past and more recent urbanization. Remaining habitats are small, isolated, scarce and highly fragmented, particularly on the Mountain. Some remaining habitats risk losing their ability to support viable fish and wildlife populations.

Targets (Long Term Goals):

- enhanced and/or restored natural habitat the Regional Greenlands strategy with regard to the watershed is incorporated into the Regional Official Plan
 - Environmentally Sensitive Areas are delineated in local municipal Official Plans
 - erosion and sediment control plans are implemented and maintained as per approvals
 - existing forests and wetlands are enhanced and expanded
 - aquatic habitat is enhanced and expanded
- Options:**
1. Employ land use and resource management tools to protect natural habitat

(4.3)

Issues & Options: Habitat Protection & Restoration

from further fragmentation and elimination or to facilitate restoration of natural habitat on private and public lands. Emphasis should be on wetland and forest habitats:

- develop appropriate management policies or restoration strategies for incorporation into OPs, CA master plans and other land use documents or guidelines
 - protect (or enhance) habitat through subdivision/site plan reviews
 - map locations of priority areas for habitat enhancement and restoration
 - incorporate Greenlands or natural heritage policies into Regional and Local Ops
 - ensure that all ESAs are identified in Ops and other planning documents
- 2 Actively protect and enhance natural habitats and their functions:
- enhance or expand habitats and link them with similar habitat or with stable habitat which can serve as a buffer
 - undertake initiatives intended to improve overall water quality
 - undertake initiatives intended to restore more natural hydrological functions and processes
 - establish a stewardship program for private properties including business parks
- 3 Re-establish lost habitat and species where possible:

(4.3)

Issues & Options: Social Development & Health

The Social Development and Health Working Group ... three occasions to consider key issues related to its area of interest.

This theme area encompasses an initial session scoping a possible set of interests. The areas selected were air quality, health and safety concerns, and social values research.

Issues That Should Be Addressed Immediately

Issue: Air Quality

This issue has two aspects. First, data generated by local air quality monitoring provides a perspective on conditions across the City of Hamilton as a whole. Consequently, conditions in the Watershed cannot be characterized in isolation from the larger airshed. Air pollutants generated within the Watershed are not confined within its boundaries and some pollutants drift into the Watershed from other locales. Actions to address air quality problems must consider this broader context and compliment the efforts taken on a wider scale.

The second aspect pertains to monitoring. Air quality data is not available for the entire Watershed. Monitoring stations are located in the City of Hamilton. There are no stations in Stoney Creek or Glanbrook.

Target (Long Term Goal):

- the Watershed Community takes actions to reduce air quality problems which affect part or all of the Watershed

Options:

1. Review the report of the Hamilton Air Quality Initiative (HAQI) which has characterized the state of air in the Hamilton Harbour watershed and is due for release during the early autumn of 1997;
2. incorporate relevant data and air issues from the HAQI initiative into

the State of the Watershed Report and the Watershed Plan

- identify action recommendations in HAQI's final report which are applicable and worthy of implementation through the Watershed Plan and incorporate them into the final document.
- 2. Enhance the present monitoring network:
 - reinstate the East End monitoring station at Nash and Kentley
 - explore options for community-based air monitoring
 - make the temporary air monitoring station in the Red Hill Valley permanent

Issue: Meteorological Effects of Red Hill Valley

Topography can create complex meteorology which can affect the dispersal of air pollutants. The Red Hill Valley is particularly distinct in this regard and its meteorological effects are not well known.

Target (Long Term Goal):

- an understanding of the effect that the Red Hill Valley has on meteorology.

Options:

1. Enhance the knowledge base:
 - undertake a study of the meteorological effects of the Red Hill Valley and the implications for air quality

Issue : Health and Safety Concerns

The public should be informed about areas of the Watershed that may not be desirable for some activities. For example, creek water at the site and downstream of combined sewer overflows is high in bacteria. The public should not be walking around closed landfill sites unless areas have been secured. A final area of concern is air quality. Air pollutants, notably fine particles and ozone have been shown to have health effects.

Target (Long Term Goal):

- people using the Watershed are aware of areas where activities should be restricted

Options:

1. Raise public awareness:
 - identify and monitor locations where activities are not recommended
 - develop a public awareness program including signage and literature to alert the community to these locations and to suggest alternative locations for activities
 - identify the types of activities occurring in these locations and develop alternatives
2. Reduce the undesirable conditions:
 - implement remediation efforts to improve water quality
 - develop a management strategy to facilitate public access through the Brampton and Upper Ottawa landfill sites

Issues & Options: Social Development & Health

Issue: Social Values Research

There has been limited research conducted in the Watershed to assess the perceptions and values of community members relative to natural areas, open space and recreation, environmental, social and economic issues. Important decisions are being made on a regular basis in the absence of this type of information.

Target (Long Term Goal):

- an understanding of community values to guide decision-making

Options:

1. Undertake research to develop and periodically update a database on community values, needs and perceptions:
 - establish a co-operative effort by a variety of Watershed partners to design and implement a comprehensive and statistically valid survey of Watershed residents
 - recommend this subject area as a source of appropriate research topics for secondary and post-secondary students

Issues & Options: Trails, Recreation, Open Space & Cultural Heritage

(4.3)

Issues & Options: Trails, Recreation, Open Space & Cultural Heritage

The Trails, Recreation, Open Space and Cultural Heritage working group met to consider key issues related to this diverse theme. Opportunities and actions for addressing the issues were also discussed.

At its initial session the Working Group concluded that Cultural Heritage was quite distinct from the other themes. They concluded that it would be mutually beneficial to keep Cultural Heritage grouped with Recreation and Trails because there were a number of common issues and interests which lent themselves to innovative action ideas.

In the interest of taking some opportunities that may be available as a result of Regional and other projects, the following discusses those issues which the working group believes should be addressed immediately. Additional issues which should be pursued at a later date are listed at the end of the summary.

Issues That Should Be Addressed Immediately

Issue: More Data Needed to Support Decision-making

Information available to support decisions about recreation, open space and cultural heritage is not uniform across the watershed. Impacts of decisions made in the absence of this data may be exacerbating the other issues identified in this summary.

Targets (Long Term Goals):

- Consistent and complete databases to support decision-making

Options:

1. Complete or update the databases and collect information needed to manage trails, recreation, open space and cultural heritage resources:

- complete inventory of cultural resources using a standardized format across the watershed
- refine understanding of current and anticipated demand for various recreational activities and open space opportunities
- undertake an analysis of the economic development opportunities associated with recreational, open space and cultural resources of the watershed

Issue: Lack of General Awareness about the Watershed's Cultural and Natural Heritage Resources

There is growing demand and interest in guided walks focused on the Watershed's cultural and natural heritage. Initiatives associated with the Niagara Escarpment and Lake Ontario Waterfront Trail have also highlighted the potential importance of the area. In spite of this positive trend, large sectors of the community have not developed an awareness or understanding of the range of opportunities and significance of the features and attractions of the Watershed. This may be reflected in decisions and behaviours which threaten or degrade these valuable resources.

Targets (Long Term Goals):

- Support for Watershed heritage.
- Visible heritage projects in the Watershed.

Options:

1. Design and implement programs and products for interpretation and management of cultural and recreational resources and opportunities

- develop a map and info brochure about lost streams in the Watershed
- establish a cultural heritage plaque program
- build on ongoing efforts to establish a history of the watershed incorporating oral accounts of long time residents

- establish a scenic routes system in the Watershed

2. Establish a permanent facility or other appropriate mechanism for conservation and interpretation of the Watershed's cultural and heritage resources including artifacts:

- locate a major Niagara Escarpment interpretive facility in the Watershed
- establish a repository for historical artifacts, possibly in a historic building in the Watershed
- use Watershed Interpretive Centre as a permanent base for educational programs and activities

Issue: Overcoming Barriers to a Fully Integrated Network of Trails

The Red Hill Watershed contains a partially integrated system of trails which in turn provide linkages beyond the boundaries of the watershed and Hamilton-Wentworth Region.

There are a number of barriers to completing linkages between these trails including existing and proposed transportation infrastructure, private land ownership and watercourses.

Targets (Long Term Goals):

- an integrated trail system for all types of users that links natural and urban areas

Options:

1. Complete or update trails master plans

Issues & Options:

- develop master plan for Rymal Road Rail Trail to Caledonia
 - update Regional bicycling master plan
2. Design and construct linkages over/around physical barriers such as the East-West Expressway and QEW
- washrooms) for trail users throughout the watershed
- 3. Close or redesign facilities which do not have the capacity to withstand pressures being placed on them
 - 4. Address conservation of cultural heritage in land use decision-making
 - develop an archaeological master plan for the Region
 - 5. Rehabilitate and use abandoned heritage structures
 - renovate Grassie Blacksmith Shop for use as a shelter

Issue: Conservation of Cultural, Recreation and Open Space Resources

Human decisions and activities have damaged or destroyed the Watershed's cultural and natural heritage resources.

Agriculture and urban development have erased important elements of our cultural legacy. Intensive and at times inappropriate activities in natural areas has caused damage to facilities and natural areas.

Targets (Long Term Goals):

- a recreational and heritage management system that reflects natural and heritage features and meets urban demands for types of uses.

Options:

1. Encourage appropriate activities and behaviour on trails and in open space areas
2. Design and construct facilities geared to the specific needs of user groups
 - develop mountain biking facility away from sensitive natural areas and trails (possibly Taro or Upper Ottawa Street closed landfill sites)
 - identify or establish facilities (e.g.

(4.3) Expressway Actions

4.4 Expressway Impacts that could be Reduced through Minor Design Changes

As mentioned in Chapter 1, the Red Hill Creek Watershed Plan (the Plan) is intended to provide a framework and guidance for managing change in the watershed. Specifically, it is meant to influence planning, management and stewardship decisions, taking at all levels, from senior governments to individual residents of the Watershed, in the hopes of fostering long term environmental, social and economic sustainability.

The Region is currently reviewing the issues and options to determine the actions it can commit to before the Plan is finalized. The Regional Transportation Department's Special Projects Office, manages the planning, design and construction of the Expressway. As a line department of the Region, it has a responsibility to communicate to the Region's Watershed Plan representative (Jim Thoms, Commissioner of Environment) the actions that can be taken to support the Watershed Plan goals. At this time, Expressway project staff are undertaking a number of studies that recognize many of the watershed goals, issues and options.

Specifically, the Expressway Impact Assessment and Design Process will carry out at a minimum the following actions:

Water

- develop and implement a system of storm runoff quantity and quality control measures for the Expressway that recognizes stormwater needs in the watershed and, as necessary, accommodate the needs of other developments;

- design and assess the impacts of creek stabilization measures (specifically natural channel design related to the main channel of the Red Hill Creek in the lower Valley);
- develop and implement a landscaping plan that addresses vegetation losses caused by the Expressway and recognizes the restoration opportunities outlined in the Watershed Plan (specifically, focus program activities along the Expressway right-of-way and in areas identified by the Watershed Plan);
- incorporate the development of a Combined Sewer Overflow pipe in the Valley during Expressway design and construction to provide improvements to water quality caused by combined sewer overflows; and
- assess and mitigate for possible groundwater impacts

Habitat Protection and Restoration

- develop a habitat restoration plan that reflects the priorities identified by the Habitat Working Group;
- where feasible, modify existing barriers to fish migration;
- compensate for lost fish habitat;
- within the context of the Watershed Plan, re-establish lost terrestrial habitat and species where feasible;
- protect and enhance natural habitats and their functions where possible; and

- inform decision makers of the extent and magnitude of existing habitat features, functions, and linkages that will be impacted by the Expressway after mitigation and compensation has been taken into account

Social Development and Health

- review the results of the Hamilton Air Quality Initiative (HAQI) in conjunction with the air quality impact assessment program;
- investigate the possibility of the temporary air monitoring station in the Red Hill Valley at the King Street becoming permanent;
- assess the worst case impact on thermal loading within the City due to the loss of the Red Hill Creek tree canopy and assess the impact of thermal loading within the Red Hill Creek Valley; and,
- mitigate water quality impacts attributable to the Expressway (see Water).

Trails, Recreation, Open Space and Cultural Heritage

- where appropriate, reflect Watershed heritage in mitigation efforts associated with the Expressway; and,
- maintain and/or assist with the development of a fully integrated trail network (e.g., a viaduct at the foot of the escarpment will be built to maintain an east-west pedestrian/cyclist connection, community access to the Valley near

Greenhill Avenue and across the Valley near Melvin Avenue will be provided, and a possible pedestrian/cyclist connections to the Waterfront Trail across the QEW will be investigated).

4.4 Expressway Impacts that could be Reduced through Minor Design Changes

The following summarizes the advice Expressway consultants have for the community, government agencies and regional staff concerning minor horizontal and vertical design changes to the current Expressway alignment (see Chapter 3). Reviewers should keep in mind that mitigation/compensation measures (e.g., landscaping, noise walls - see pages 29 to 31 of the Exemption Order, May 1996 for a more thorough list) will be developed after design changes to the existing alignment are established.

The Region and MTO are prepared to carry out impact prediction work on both the new designs and the current Expressway alignment in order to determine their relative merits.

The following will now illustrate and describe the minor design changes that should be considered.

Minor Design Changes: Map 1

CHAPTER 4



MAP LEGEND

Expressway footprint design modifications should be considered to minimize terrestrial impacts

Area where the Creek will be relocated and allowed to stabilize

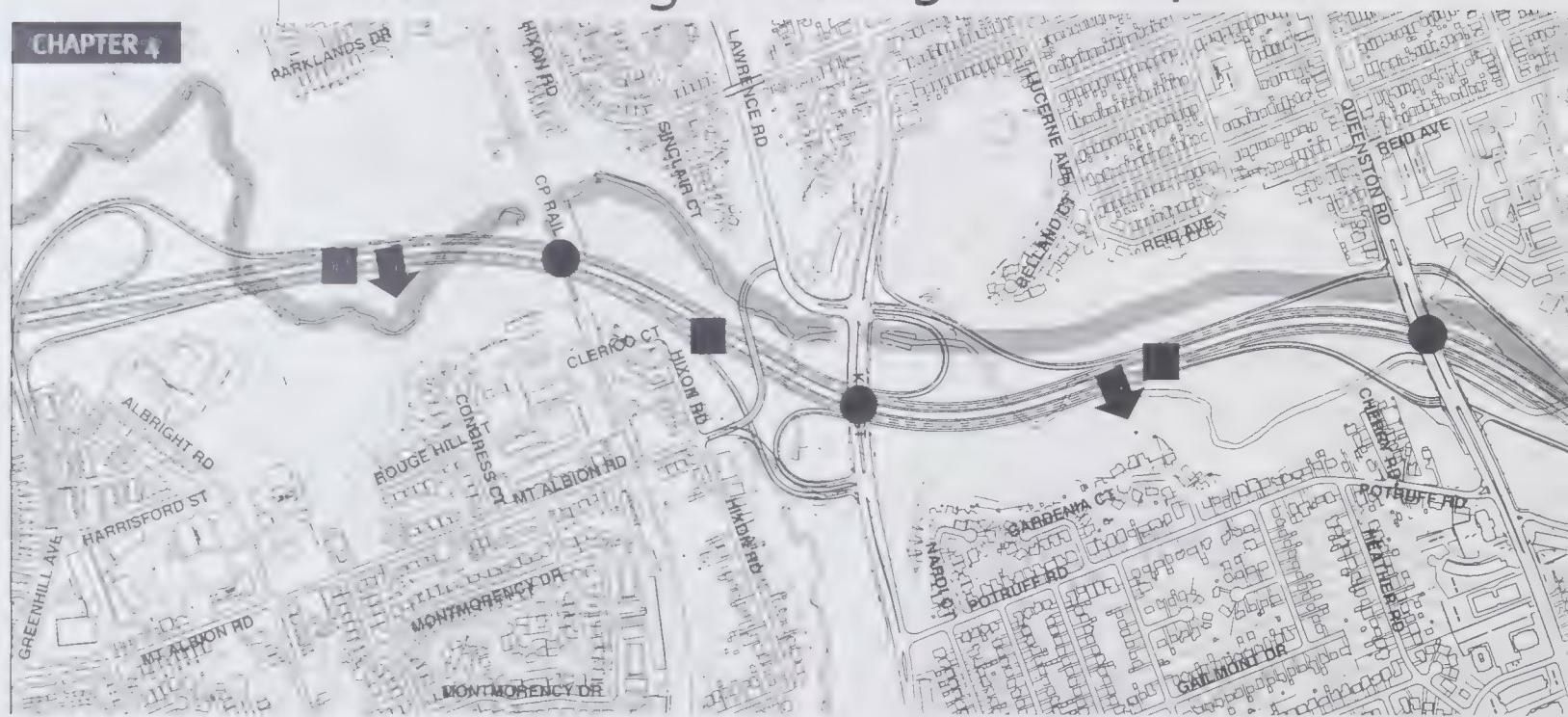
Direction the Expressway should be realigned

Location where interchange/bridge design modifications should be considered



Minor Design Changes: Map 2

CHAPTER 4



MAP LEGEND

- Expressway footprint design modifications should be considered to minimize terrestrial impacts
- Area where the Creek will be relocated and allowed to stabilize
- Direction the Expressway should be realigned
- Location where interchange/bridge design modifications should be considered



Minor Design Changes: Map 3

CHAPTER 4



MAP LEGEND

Expressway footprint modifications should be considered to minimize terrestrial impacts

Area where the Creek will be relocated and allowed to stabilize

Escarpm ent viaduct/bridge

Location where interchange/bridge design modifications should be considered



(4.4)

Terrestrial

Section 2.3 summarized key areas of concern with respect to terrestrial functions, linkages and attributes in the valley which are likely to experience direct impacts from the construction and/or operation of the Expressway. Minor changes in the design of the Expressway as outlined below are intended to facilitate impact reduction in these areas of concern. Three types of design changes are proposed:

1. Alignment recommendations refer to changes in the Expressway's horizontal alignment
2. Footprint reductions may involve lowering the road elevation, placing the road on structure and re-examining the lane placement or ramp entry points to fine tune the design
3. Interchange/structure modification.

Section 1: QEW to CNR

- Footprint reductions are recommended to reduce the extent of impacts to forested valley slopes along the east bank immediately downstream of the CNR crossing.

Section 2: CNR to Barton Street

- Re-align this section of the Expressway and Barton Street interchange so that it hugs the eastern valley wall. This will provide a more contiguous floodplain area where natural floodplain dynamics and Carolinian floodplain forest habitats can eventually be restored (see Streams and Surface Water). This eastern alignment will also reduce potential impacts to higher quality oak-hickory forest habitats located along the western valley wall.
- Footprint reductions and interchange design modifications can provide more area for floodplain habitat restoration and further reduce potential impacts to the oak-hickory forest habitats along the western valley wall.

Section 3: Barton Street to Queenston Road

- Re-align the expressway and interchange in the vicinity of Queenston Road so that it hugs the eastern valley wall. This will avoid impacting high quality specialized habitats along the western valley wall (i.e., the exposed ancestral creek bank at Queenston Road).
- Footprint reductions and interchange design modifications can be used to provide more area for floodplain habitat restoration and further reduce potential impacts to the specialized habitats along the western valley wall.

- Interchange and expressway structures should be designed to improve habitat connectivity.

Section 4: Queenston Road to King Street

- Footprint reductions and interchange design modifications can provide further protection to specialized habitats within the floodplain and on the valley slopes.

Section 5: King Street to TH&B

- Footprint reductions and interchange design modifications can provide further protection to forested slopes and floodplain community.
- Interchange and expressway structures should be designed to improve habitat connectivity, especially at the Davis Creek confluence with Red Hill Creek.

Section 6: TH&B to Greenhill Avenue

- Footprint reductions and interchange design modifications are recommended to protect mature forested slopes and mature remnant Carolinian floodplain community.
- Interchange and expressway structures should be designed to improve habitat connectivity

Section 7: Greenhill Avenue to Escarpment

- Footprint reductions are recommended to protect specialized dry meadow, marsh and escarpment complex habitats
- Escarpment crossing structures should be designed to improve habitat connectivity across the Escarpment corridor as well as the Bruce Trail connection

Section 8: Escarpment to Mud Street

- Footprint reductions are recommended to increase potential areas for restoration and reforestation.

Stream

The 5100 metre section of Red Hill Creek that extends from approximately the Greenhill Avenue interchange to Brampton St. landfill site is actively eroding at rates above normal given the area topography, vegetation and geology. Factors that have contributed to this instability problem can be attributed to land use and infrastructure development in and adjacent to the creek. Evidence of this problem can be seen 50 to 300m down stream of existing structures where erosion activity is high.

Further development of this kind along other portions of the creek may lead to similar impacts. In those instances, techniques to manage erosion and stabilize the creek are limited to traditional engineering solutions, such as concrete or armoured channels and/or bio-engineering which over the

long run are costly to maintain.

The current Expressway alignment would increase the total number of Creek crossings by a maximum of sixteen. In terms of creek coverage by structures, the total length will increase from 340m to 1170m. In places where the current Expressway alignment covers long stretches of creek (e.g., immediately north of King Street), channel relocation efforts will have to be undertaken. In total, 550 metres of creek would have to be relocated given the current alignment.

Design changes that could address previously stated watershed issues and mitigate the aforementioned problems are as follows:

- decrease the number of bridge crossings and in-stream structures by realigning the creek (to the west) and Expressway (to the east) in the areas of; Greenhill Avenue to TH&B, King Street to north of Queenston Road, and Melvin to the north of CNR. Design modifications must allow sufficient area to construct a stable creek;
- increase stream stability through natural channel design techniques - this would involve realigning the creek channel in a stable form on the west side of the Expressway; and,
- considering alternative bridge crossing configurations which are compatible with flow velocities and sediment transport.

Surface Water/Water Quality

Expressway development within the Red Hill Valley will reduce existing flood plain storage and conveyance. Without proper mitigation this may increase downstream flow rates and flood levels which in turn could increase flooding, potential erosion and further degrade water quality.

Minor changes in the horizontal and vertical alignment of the Expressway that could benefit surface water and water quality are as follows:

- decrease the interference the existing Expressway design has on the existing creek alignment - see stream suggestions;
- where flood plain storage and conveyance problems exist (i.e., CNR, Barton, and upstream of TH&B) build the Expressway on structure instead of fill material. This design modification would allow flood waters to flow underneath the Expressway in key places (i.e., CNR, Queenston and upstream of TH&B); and,
- where increased upstream flood levels and stream velocities are likely to occur given the current Expressway design, construct ramps on elevated structure (as opposed to fill/culverts) and/or raise the Expressway's vertical alignment to ensure sufficient culvert opening size.

A full range of other mitigative measures will be developed after design modification are addressed.

Groundwater

Design changes would have no appreciable effect on regional groundwater resources.

Fisheries

Detailed examination of the crossings of the Red Hill Creek Expressway should be undertaken to ensure that the various structures will not, either individually or collectively, result in future degradation of stream habitat.

Where possible, efforts to stabilize the creek as previously mentioned would create opportunities to improve/create fish habitat.

Cultural Heritage

Design options for preserving known archeological, built heritage and cultural landscape resources may consider the use of elevated ramps and roadways and/or changes in the overall design. However, where impacts are unavoidable, a number of mitigative options exist.

Known and Potential Contaminant Sources

The major expressway impact related to site contamination is construction of the Expressway through land that is presently contaminated. As discussed in Section 2.3, it is expected that heavy contamination may be encountered north of Barton Street. It is unlikely that minor design changes will reduce this impact. However, construction on the east side of Red Hill Creek in this

area may encounter contamination that is more localized than that encountered in the landfill on the west side of the creek.

Visual Resources

Comments regarding potential design changes to the escarpment crossing cannot be articulated until a workshop with directly affected parties is convened (December, 1997).

Public and Private Property

If possible, horizontal or vertical shifts in the Expressway alignment at Nash Road and Brampton Street should be considered.

Noise

Horizontal alignment affects the distance separation between the source of noise (i.e., Expressway traffic) and the receptor (i.e., someone's home). In general noise from a highway changes at a rate of 3 - 5 dBA when the distance separation is doubled. Assuming ideal conditions, minor changes in the Expressway alignment (i.e., 8% - 15% of the existing separation distance) would be expected to have an insignificant effect of 0.5 dBA - 1 dBA. Thus, alignment changes in the order of 50 metres would achieve a 5 dBA change in sound exposure.

Vertical shifts have the potential to reduce noise levels to a greater extent than changes in the horizontal alignment. The effectiveness of a noise barrier, whether as part of specific mitigation measures incorporated into the highway design, or as

4.5 Next Steps

inherent topographical features (e.g. highway in cut), is determined by the extent to which the line of sight between highway and receiver is broken. In some cases, minor differences in elevation of 1 m can result in large changes in barrier attenuation.

Vertical alignments which affect grades, also affect the noise generated, particularly by heavy trucks using low gears. However, for the range of grades (<1% to 4% grade) and volume of truck traffic (10% of total volume) anticipated, the difference due to grade would be insignificant for the main line and less than 1 dBA. Steep grades (7% or more) on ramps and long grades should be minimized and avoided where possible, as vehicles on these grades can generate significant noise.

Air Quality

From an air quality perspective, minor design changes will not significantly alter the pollutant levels created by vehicular traffic. Minor horizontal re-alignment of the expressway will not alter the impacts of pollutant emissions, unless the alignment brings the roadway considerably closer to sensitive receptor locations, such as residences or schools. Similarly, changes in elevation of the expressway will not change pollutant emissions, and their impacts will not change unless the roadway is brought closer to residences. Extreme road grades should be minimized to avoid the extra load put on truck engines, which cause increased emissions.

In general, dispersion of pollutants increases with distance away from the source. Therefore, efforts should be made to separate the expressway from receptors to the greatest degree possible. Clusters of idling vehicles make a greater contribution to pollutant levels than moving vehicles, and thus the expressway and interchanges should be designed to minimize vehicle deceleration, idling, and acceleration. Vehicle speed has some effect on pollutant emissions; however, the difference in emissions between 80 km/hr or 90 km/hr is not significant. For CO and NO_x, mass emissions (in grams of pollutant per km travelled) are typically lowest at about 90 km/hr (55 mph), with increased emissions at the lower speeds and higher speeds. For PM₁₀, the contribution from tailpipe emissions is generally insignificant compared to the particulate entrained due to the tire and roadway interaction. Vehicle speed does not affect PM₁₀ levels, except in the case of idling vehicles, which will not contribute to entrained dust.

4.5 Next Steps

As previously mentioned, the Region and MTO will carry out impact prediction work on both the new designs and the current Expressway alignment in order to determine their relative merits. The timing of this work should begin in January, 1998. Documentation of predicted impacts, mitigation/compensation measures, evaluation and selection of a preferred Expressway North-South design (QEW to Mud Street), and consultation activities, will be provided in the last volume of this report.

Notes &
Thoughts



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